REPORT OF THE KING INSTITUTE OF PREVENTIVE MEDICINE, GUINDY

FOR THE PERIOD FROM 1ST OCTOBER 1941 TO 31ST MARCH 1946

BY

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AND

REPORT OF THE GOVERNMENT ANALYST, MADRAS

BY

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REPORT OF THE KING INSTITUTE OF PREVENTIVE MEDICINE, GUINDY, FOR THE PERIOD FROM 1ST OCTOBER 1941 TO 31ST MARCH 1946

STAFF AS IT STOOD ON 31ST MARCH 1946.

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Dr. R. Narayanan, M.B.B.S.

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Sri P. V. Sitarama Ayyar, M.A.

Bio-Chemist, Department of Anti-toxin.

Dr. P. Seshagiri Rao, D.SC.

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	Sri K. V. Sadanandan.
Junior Public Health Assistants ..	Sri N. Swaminathan, B.SC., A.I.I.SC.
	,, K. R. Ramaswami, B.SC.
	,, K. P. Ramakrishnan, B.SC.
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Algologist	Sri K. G. Veeraraghavan, M.SC.
Junior Chemical Assistants ..	Sri V. R. Srinivasan, M.A.
	,, K. Lakshminarayanan, B.SC.

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Additional Government Analyst (temporary).	Sri K. V. Sundaram Ayyar, M.SC., F.R.I.C.
Senior Assistant to Government Analyst.	Sri S. Narayana Ayyar, M.A., A.I.I.SC., A.R.I.C.
Additional Senior Assistant to Government Analyst (temporary).	Sri Y. G. Doraiswami, M.SC.

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	,, K. Narayanaswami, B.SC. (Hons.).
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	,, S. Balakrishnan, B.SC. (Hons.)
	,, M. V. Narayanan, B.SC. (Hons.)
	,, C. S. Raghunathan, B.SC. (Hons.)
Junior Assistants to the Government Analyst (temporary).	Sri K. Balasubramanian, B.SC. (Hons.).
	,, K. Ramachandran, B.SC. (Hons.)
	,, V. V. Ramana Rao, B.SC. (Hons.)

Office Establishment.

Manager	Mr. E. C. Bonnell.
Librarian	Sri V. Srinivasa Ayyangar.
Permanent	Accountant 1; Clerks, Upper Division, 3; Clerks, Lower Division, 9; Typists 3; Steno-typist 1; Telephone attenders 2; Muchi 1; Attender 1; Peons 9.
Temporary	Cashier 1; Clerks, Upper Division, 1; Clerks, Lower Division, 6; Typist 1; Steno-typist 1; Attender 1; Peon 1.

Laboratory Staff.

Permanent	Sample takers 4; Technicians 7; Laboratory attendants, I grade, 12; Laboratory attendants, II grade, 29; Compounder 1; Peons 27.
Temporary	Technical Assistants 3; Sample taker 1; Technicians 9; Laboratory attendants, I grade, 21; Laboratory attendants, II grade, 22; Algæ collector 1; Peons 35.
Miscellaneous staff (permanent) ..	Photo Artist 1; Overseer 1; Assistant Overseers 4; Mechanic 1 (temporary); Deputy Overseer 1; Electrician 1.

Experimental Filter Station.

Technical Assistant 1, Mechanic *cum* Filter Operator 1, Turncock 1 (temporary), Assistant Mechanic 1.

Staff of the Associated Enquiries under the Indian Research Fund Association.

(1) *Cholera Treatment Unit.*

Bacteriologist	Dr. K. Bhaskaran, B.SC., M.B.B.S.
Field Medical Officer	Dr. R. Sundararajan, B.A., M.B.B.SC.
Laboratory Assistant (Bacteriological Unit).	Sri K. Ramanujam, B.SC.
Field Assistant and two unskilled Assistants.	Sri S. Rajagopalan, B.SC.

(2) *Enquiry to prepare Monospecific High Titre Cholera Sera.*

Laboratory Assistant .. .. Sri M. L. Sharma, M.SC.

(3) *The Filterable Viruses Enquiry.*

Bacteriologist .. .. .. Dr. G. N. V. Krishnan, L.M.P., D.L.SC.
Laboratory workers .. .. .. Sri K. N. Gopalan, B.SC.
,, N. K. Velanker, B.SC. (Hons.)
,, V. V. S. Prakasa Rao, B.SC.

and one Technician, one Laboratory attendant and one unskilled Assistant.

The following officers left the Institute on transfer:—

Dr. Y. S. Narayana Rao, M.B.B.S., D.T.M., D.B. (Lond.).
Rao Sahib Dr. Ram Annamalai, L.M.S., S.A.
Rao Sahib Dr. K. S. Ranganathan, M.R.C.S. (Eng.), L.R.C.P. (Lond.).
Dr. Syed Muhammad Ghouse, M.B.B.S., B.S.SC.
Dr. K. Subba Rao.
Dr. S. Sumitra Rao.
Dr. V. Krishnamurthi.
Dr. (Miss) M. Jubai.
Dr. (Mrs.) V. Krishnaswami.
Dr. S. Francis Xavier.
Dr. K. Ramanujam.

PART I.—ROUTINE WORK.

1. GENERAL REVIEW.

The last published annual report of the institute was for the year from 1st October 1940 to 30th September 1941. During the succeeding war years, the activities of the Institute were expanded in several directions. The new activities included the establishment of the Department of Anti-toxins, a section of Algology, a section for the manufacture and supply of essential sterile solutions for parenteral injections, and the establishment of the Blood Bank.

The increased activities are reflected in enhanced budget allotments from year to year made to the Institute from provincial funds. The total budget allotment in the financial year 1941–42 was Rs. 4,95,450 while in 1942–43 it was Rs. 5,82,677, in 1943–44 Rs. 6,79,638, in 1944–45 Rs. 6,92,703 and Rs. 10,06,325 in 1945–46. Most of the Institute's services are rendered free of charge to Government departments. However, the actual receipts for the respective years by way of sale proceeds of vaccines and sera and services rendered to railways, other Provincial Governments and private medical practitioners, etc., were as follows:—Rs. 1,09,800 in 1941–42, Rs. 1,64,680 in 1942–43, Rs. 2,83,111 in 1943–44, Rs. 2,58,858 in 1944–45 and Rs. 4,47,617 in 1945–46. The details of receipts and expenditure are given in Table I-A in which the net cost of the Institute debitable to provincial funds during respective years is also given.

In arriving at an estimate of total income of the Institute, it has been the usual practice in previous years to take into account charges which would have been debitable to Government medical institutions, the Public Health Department and local authorities in respect of supplies and services rendered at rates approved by Government if these had not been free. As a matter of interest, the total income has been estimated in this manner for the period from 1st October 1944 to 31st March 1946 and given in Table I-B. The difference between the estimated income and the estimated expenditure, viz., over Rs. 10,00,000 represents the net savings to Government by having these services rendered through the Institute. The nature and extent of such services will be apparent from reports of sections given separately.

Vaccine Lymph Section.—Total issues of vaccine lymph have increased from year to year reaching a record total of 272,816 c.c. in 1944–45. The supplies of vaccine lymph were also made to the Army authorities in South India, the American Army in the India-Burma theatre and to the Governments of Bengal and Ceylon. To meet this demand, lymph manufacture had to be

carried on throughout the year, and a rapid method of purification of lymph by chloroform had to be adopted. The method has been found to be satisfactory. As pointed out in the sectional report, maintenance of potency of lymph during transit and other factors involved in the utilization of lymph in districts deserve special study.

Diagnostic Department.—The microscopical, bacteriological and serological examinations conducted in this department during 1945–46 amounted to 13,082, while the number of Kahn and Wassermann tests performed during the same period was 60,330. These figures have shown little variations from year to year. The department has now undertaken the manufacture and issue of diagnostic sera and antigens for use in other Government, municipal and private laboratories in the Province.

Bacterial vaccines.—In 1942–43, the Province was swept by a cholera epidemic of unusual severity. Starting in the northern districts, the epidemic spread with alarming rapidity to almost all the districts in the Province. The demands for cholera vaccine continued to pour in the Institute from June 1942 to end of February 1943. Five subsidiary centres were opened in selected places, one for each group of districts for distribution of cholera vaccine and in many cases the vaccine was distributed from the Institute by special messengers. In this way, it was possible to reach the vaccine to affected areas as expeditiously as possible.

The burden of manufacture of cholera vaccine fell on the bacterial vaccine section, and its staff had to be augmented by drafting personnel from other departments in the Institute. Total issues of this vaccine for the whole epidemic amounted to nearly 19 million doses which had to be manufactured during the same epidemic period. Yearly issues are given in the sectional report.

For the last three years, cholera vaccine is being regularly supplied to the Government of Central Provinces and Berar. Arrangements were made in the Institute by appointing special staff, etc., to meet this large demand.

In addition to meeting such demands, supplies of cholera vaccine were also made to the Government of Bengal during the famine emergency and to several Indian States in North and South India. This experience was both a lesson and a warning. To meet such emergencies in future, the physical facilities were reorganized as far as was practicable, and the staff of the section was also augmented.

Sterile Solutions Section.—This section issued, in 1944–45, nearly 120,000 ampoules of glucose solution alone for use in Government hospitals. When the section was started late in 1941, the estimated requirements of the hospitals at the time were small and only 40,000 ampoules were issued in 1941–42 and 30,000 ampoules in 1942–43. The demands for sterile solutions are definitely on the increase and if these have to be met from the Institute in full, increased accommodation for the section will have to be provided for the purpose.

The Department of Anti-toxins.—Started in 1943, the department had to carry on its activities with considerable difficulties. It had to struggle initially with such apparatus and equipment as could be obtained in the country, and as could be improvised in the Institute. So far, the Institute has been able to meet only one-third of the total requirements of the Province. Once the new building, which is under construction, is ready for occupation, the work in this department can be stepped up considerably.

Blood Bank.—Special attention has to be drawn to the sectional report on the Blood Bank. It is interesting to note that over 1,700 persons had volunteered as donors each year during the war years 1942–44. There was a sudden drop in donations, only 998, in 1945. Since the inception of the Bank, 30 litres of whole blood, and nearly 1,000 litres of plasma and nearly 275 litres of reconstituted blood were issued to City hospitals. The total number of transfusions performed was 737.

In view of the fact that considerable propaganda was needed to educate the public on the usefulness of blood transfusion, and the harmlessness of blood

donation, the above record of work cannot be considered as unsatisfactory. Such success as was achieved by the Bank was in great measure due to the efforts of the non-official committee, which the Government had appointed to help the Bank in securing adequate number of donors.

Blood transfusion is now regarded as an essential therapeutic measure in the treatment of many medical and surgical conditions. It was, therefore, necessary to reorganize this activity and establish it firmly on a peace-time basis. Banks have now been established in the two hospitals in Madras and one in Vizagapatam. The Institute will be the processing centre for plasma and will continue to receive donations from private organizations as was the practice hitherto.

In addition, as an inducement to persons to volunteer as donors, the Government have sanctioned a sum of Rs. 5 per donor. The Government have also permitted the issue of blood and plasma to recognized medical practitioners on payment. These measures have already shown encouraging results.

Water analysis and algæ control.—The variety of work carried out in the Department of Water Analysis and Algæ Control, hitherto designated as the Public Health Section, will be evident from the report of the section where its functions have been stated in detail. The number of water samples examined for potability, non-domestic purposes, for algal troubles and at the Experimental Filter Station, Kilpauk, during the year 1944–45 reached a record figure of 13,772. Due to abnormal conditions created by the war, schemes for the extension of protected water-supplies and sewage disposal to many more urban and rural areas of this Province could not be proceeded with. The disposal of factory wastes and town sewage will create major public health problems relating to prevention of pollution of water sources and safeguarding their purity. As these schemes get under way, there will be a further increase in the activities of this department. Moreover, the industrial expansion envisaged under the post-war development programme of Government will also necessitate the examination of a greater number of samples of water for their suitability and conditioning for various industries.

As the Government are aware, a new section of Algology was opened in the Institute in the year 1941 to maintain an efficient control over algal growths found to flourish in some of the water-supplies in the Province. Control measures have now been adopted in twelve of the municipal water-supplies. Researches on the seasonal variations and preponderance of alæ in stored waters have shown that they exhibit a marked correlation with the meteorological conditions, the acidity of water and its organic matter, silica and iron content. The behaviour of different species of algæ has been studied and their growth trends recorded from time to time. When this work is extended further, data will be available in due course which would enable us to anticipate algal troubles and to adopt suitable remedial measures in time.

As the sectional report would show, there has been a considerable increase in the number of disinfectants tested in the Institute. It has been our experience that the various brands of disinfectants available in the market are practically valueless as germicides for general disinfection purposes and their widespread use for practical disinfection by local bodies, Government departments and health authorities only helps to engender a false sense of security. Most of them are at best deoderants. The popularity of these so-called coal tar disinfectants is mainly due to the aesthetic desire to eliminate offensive odours which are often associated with disease. Many disinfectants received for test in the laboratory during the war gave Rideal Walker Co-efficient values below one. Recommendations have been made to the Government for laying down some uniform policy in the purchase of disinfectants by local bodies and others. Rideal Walker values of ten for high class disinfectants and five for disinfectants for general use, have been recommended for adoption.

A memorandum on the organization of the Public Health Section was presented to the Health Survey and Development Committee of the Government

of India—the Bhore Committee—when they visited the Institute on 18th April 1944. The Committee also visited the Kilpauk Research Filter Station. Consequent on their visit, requests for detailed information on (1) methods of pre-conditioning stored waters rich in organic matter content and (2) the organization of an Experimental Filter Station were received from the Department of Public Health, Punjab, and the Director, All-India Institute of Hygiene and Public Health, Calcutta.

Library.—The library continued to expand during the period under review and at present its collections have grown to a total of about 9,000 volumes; 820 new books and bound volumes were added to the stock during this period. The number of *current periodicals* has increased to 256 (consisting of scientific periodicals and technical annual reports) as against 206 in the pre-war period. Of this number, 110 are purchased from foreign countries, 20 in India and the rest are received on exchange or free of cost. The work in the library has grown considerably with the expanded activities of the Institute and with the increasing number of members of the scientific staff in the several sections making full use of it. Some of the officers of the military department stationed in and around Madras availed of the library facilities afforded by the Institute. The circulation of periodicals and issue of books, etc., have been on the increase, e.g., 4,900 in 1941 to 9,600 in 1946. To cope up with the increase in work, a temporary post of an Assistant Librarian was sanctioned in April 1945. The annual grant of Rs. 3,000 in pre-war days has been raised to Rs. 4,500 to meet the increased expenditure on purchase of books and periodicals.

Consequent on the interruption in the means of communication during the war, there had been considerable irregularities in the receipt of foreign literature. The practice of obtaining foreign publications through local agents did not work as efficiently as could be expected. Since August 1945 the publishers are all addressed for a direct supply of our requirements and the breaks in our sets are being replenished.

Furnishing *references* to articles, compilation of bibliographies on special subjects and *translation* of articles have continued to form an important work in the library. Translation of articles on problems akin to those worked in the Institute were furnished on demand. Among others, bibliographies on "Blood Transfusion," Bacteriology and Epidemiology of cholera, "D.D.T.", "Filariasis" and "Leprosy" were prepared. In addition, a list of about 150 articles on "Penicillin" was compiled and submitted to the Director-General, Indian Medical Service, Delhi, at his instance.

In connexion with the *Post-war Reorganization proposals* of this Institute submitted in December 1943, the need for organizing the Library Service on an extended scale was stressed and a suggestion was made that such a central library service should be located at this Institute and that this Institute should also develop a "microfilming service" as contemplated by the Indian Research Fund Association. The necessity for providing larger accommodation for the library has also been impressed in it. The aim is to develop this library as a medical library for South India, affording thereby facilities to other medical institutions and also to medical practitioners.

In October 1945, the library was inspected by Lieut.-Col. D. P. McDonald, I.M.S. (Retd.), a Special Officer appointed by the Director-General, Indian Medical Service, Delhi, to inspect the medical libraries, all over India. A questionnaire from him on the present position of this library in all its aspects, with suggestions for improvement, was answered. Based on his report and the recommendations from the Surgeon-General, Madras, certain proposals for improving this library have been sent to Government and orders in respect of some have been received. The purchase of a "Microfilm reader" has also been sanctioned. A set of 34 new periodicals published in *America* has been added to the subscription list to satisfy the increasing obligations in laboratory work. The journals are on their way from 1941 onwards. Orders regarding the reorganization of the library staff—their qualifications, pay and prospects—are awaited from Government.

Researches.

The Institute continued to receive generous assistance from the Indian Research Fund Association for various researches undertaken in the Institute on problem of both provincial anl all-India importance. The research programme had necessarily to be curtailed, however, during the war, as the emphasis then was on problems directly connected with the war. The Institute had to face besides two other handicaps. One was the paucity of trained personnel and the other the difficulty of obtaining supplies of essential requisites, apparatus and chemicals even to carry on the routine work. To quote an instance, the problem of agar was at one time so acute that to conserve its use, some of the routine tests had to be dropped and steps were taken to reclaim used agar. When the manufacture of agar was attempted in the Medical Stores Depot, Madras, and elsewhere from local sea weeds, the Institute rendered such assistance as was necessary for the purpose. Paucity of trained officers was keenly felt owing to several changes in the senior and junior staff of the Institute consequent on their joining either war service or transfer to other institutions in the Province. Even so, it was possible to concentrate on some problems of public health importance, both in the laboratory and in the field.

Virus Research.—A field experiment was initiated in 1940 to test the relative values of chick membrane vaccine and calf lymph as immunising agents against smallpox. The experiment has just been concluded. Reactions after vaccination with chick membrane vaccine were milder than those obtained with calf lymph. It was also observed that the reaction with membrane lymph was delayed by 24 to 48 hours at all stages till the maximum development of pustules. Observation on the duration of immunity after vaccination with the two types of lymph as judged by revaccination with homologous and heterologous lymphs revealed some important differences. There was reason to believe that membrane lymph was much weaker antigenically than calf lymph, perhaps due to the absence of Duran-Raynals Factor in the former. Another interesting feature was that about 20 per cent of children primarily vaccinated with calf lymph lost their protection after four years as judged by revaccination results.

An opportunity to study the extent of protection afforded against smallpox by the two lymphs was provided by the occurrence of a severe epidemic of smallpox in one of the experimental villages. A detailed study was made of the vaccinal state of the population in this village. It appeared from the data collected that within the period of observation, i.e., five years, there was not any noticeable difference in the protection afforded against smallpox by the two types of lymph. A summary of the results obtained is given in Part II of this report under " Researches."

As is always the case in research, many inter-related problems were revealed during the course of this field experiment, and the subject deserves extended study.

Influenza.—A virus vaccine for the prevention of influenza has been developed in the United States and the results of its use have been encouraging. Early in the year, it was considered desirable to study this aspect in the Institute and a few doses of vaccine were made on an experimental basis. It was suggested that preliminary trials at an extended manufacture should also be made, so that a large-scale production could be attempted if needed. The initial expenses in this connexion were met by the Government of India. The virus is grown in the allantoic fluid of the developing chick embryos, and the vaccine is prepared from the fluid by the erythrocyte absorption and elution technique.

No studies have been made in India on the prevalence of types of influenza virus in epidemics of influenza. It is proposed to undertake this study shortly.

Cholera.—When the Cholera Field Inquiry under the Indian Research Fund Association was terminated in March 1942, an interim grant was made to conduct a Field Inquiry on the prevalence of carriers in cholera under epidemic

conditions. Since last year (1944–45) a Cholera Treatment Unit has been sanctioned for the evaluation of newer methods of treatment in that disease. The results of these inquiries are described in Part II of this report under "Researches." An extended trial of the value of suphaguanidine in the treatment of cholera was undertaken at the Infectious Diseases Hospital, Tondiarpet, Madras, in co-operation with the municipal authorities in 1942 and also under conditions prevailing in the districts. While the drug proved to be of some value, the need for further compounds which would be more efficacious was revealed. It is with a view to subject such drugs as may be evolved for this purpose to a fair clinical trial that a more permanent treatment unit at the Institute has been approved by the Indian Research Fund Association.

The investigation on the prevalence of cholera carriers during epidemics and shortly thereafter has shown that as many as 7 per cent in the community continued to excrete cholera vibrios, though for short periods, without apparently being ill themselves. The role of these carriers in the maintenance of infection remains to be investigated in greater detail. This will be undertaken when favourable conditions are present.

An investigation on the efficiency of anti-cholera inoculation was undertaken in co-operation with the Director of Public Health, Madras, and the results of analysis of probably the largest experience of this kind are given under "Researches" in Part II of the report. This careful statistical analysis has shown that anti-cholera inoculation is effective in reducing the incidence of cholera and is a very useful measure in the control of cholera even under conditions in which only a single inoculation was given in the presence of the epidemic.

Studies in "Bacteriology of Milk".—The work on the bacteriology of milk in connexion with the fixation of tentative bacteriological standards was started in 1944 and so far, more than 700 samples of milk drawn under varying sanitary conditions have been analysed. The contemplated standards relate only to the cleanliness and keeping quality of the milk. The results so far obtained show that under the existing conditions, a major part of the initial bacterial contamination of milk is derived from the use of unclean vessels, and that cleaning the vessels with boiling water or scalding with steam would markedly reduce the initial contamination. Further, it would be a sound practice to wash the udder of the animal with clean water and dry it before drawing milk. The relative value of various bacteriological tests in milk assay is also being studied. A report of the work so far carried out has been submitted to the Government and it is now under print.

Researches on water purification methods.—Several important experiments were carried out at the Research Filter Station, Kilpauk, during the period. The activity of this filter station is reflected in the increased number of water samples that had to be examined in connexion with the research work done there. The main experiments carried out related to the pre-conditioning of the Red Hills lake water to render it suitable for mechanical filtration; double filtration of the raw water, the primary filter being a non-submerged percolating filter followed by a sand filter working at double the normal rate; aeration of raw water by different methods prior to sand filtration to overcome post-filtration odour troubles; chloramination of the filtered water using minimal doses of chlorine and ammonia and removal of fluorine by Gooseberry logs. A detailed report on the experiments carried out at the filter station with special reference to the pre-treament of the Red Hills lake water and the purification of the Madras City Water-Supply by mechanical filters during the years 1941–45 was forwarded to the Government and the Corporation authorities early in 1946. In addition to this, detailed reports of experiments embodying the results obtained and the conclusions arrived at have been forwarded to the Government once in six months.

A short summary of some of the experiments has been given in Part II of this report under "Researches," wherein other items of research have also been listed.

Post-war developments.

The Institute has now reached the limits of its expansion and it is not possible to undertake any new activity or even to extend the present ones in any direction, with the accommodation now available. Besides there is an urgent need to decentralize some of its functions and bring the laboratory service which it now gives within easy reach of district hospitals and public health personnel in the field. The reorganization scheme proposed includes the following:—

(*a*) Establishment of Regional Laboratories at suitable centres in the Province, and (*b*) re-organization of some of the institute departments, to facilitate extended research, and conduct of routine work, particularly manufacture of biologicals in uniformity with modern principles. The proposed functions of the regional laboratories are the following:—

(*a*) A clinical laboratory for hospitals, dispensaries and public health authorities within the area,

(*b*) laboratory for the examination of foods in connexion with the Prevention of Adulteration Act,

(*c*) laboratory for the examination of waters from protected and projected water-supplies in the area,

(*d*) a subsidiary centre for the distribution of biologicals used in prevention and treatment of diseases, and

(*e*) a centre for research.

The reorganization of sections concerned in the manufacture of biologicals is an urgent necessity. No doubt the institute has hitherto met all the requirements of the public health department in respect of prophylactic vaccines for prevention of epidemics. Judging by present trends, the demands are likely to increase considerably in years to come. A stage is soon reached in the manufacture of such biologicals, when it is no longer economical to rely on improvised methods, but it is necessary to adopt modern technique with modern equipment. with laboratories constructed suitably for the purpose. The Bhore Committee have endorsed the view that Governments could themselves undertake the production of such vaccines and sera required for their own use, through their own staff and at their own institutions. Such laboratories would provide ideal standard for the trade to adopt. Accordingly, a comprehensive building programme for new laboratories has been submitted to Government. The scheme in general has been accepted by the Government, and when it is executed, the institute would be able to fulfil all its functions expected of a premier institution in the Province.

Other items of interest.

Changes in staff.—Major K. Padmanabha Menon, L.M.S., L.R.C.P. & S., was the Director of the Institute from 1st January 1942 to 14th June 1942, and Dr. K. V. Venkatraman, M.D., from 7th May 1944 to 17th June 1944, from 9th August 1944 to 19th January 1945 and from 8th April 1945 to 7th May 1945. Dr. Y. S. Narayana Rao, D.B., Assistant Director, was transferred to the Medical College, Madras, as Professor of Bacteriology. The services of Rao Sahib Dr. K. S. Ranganathan who had worked in the Institute both as Assistant Director and Blood Transfusion Officer were placed at the disposal of the Government of India for appointment as their Blood Transfusion Officer. Rao Sahib T. N. S. Raghavachari, Senior Public Health Assistant, retired from the institute after completion of 30 years of service.

2. *Deputation of officers abroad.*—(*a*) In 1942, Dr. C. G. Pandit was deputed to the United States by the Government of India to study the technique of manufacture of yellow fever vaccine as developed in the Rockefeller Institute for Medical Research, New York, and also to study the technique of manufacture of typhus vaccine as evolved in the Rocky Mountain Fever Laboratory, Montana. The International Division of the Rockefeller Foundation had provided all the facilities in this connexion.

(*b*) Dr. C. G. Pandit was again deputed in August 1944 by the Government of India to the United Kingdom, Canada and the United States, to study the newer trends in medical education and research, and to collect information

on several matters of public health importance for the Health Survey and Development Committee of the Government of India.

(c) Dr. K. V. Venkataraman was deputed in December 1945, by the Government of Madras to the United Kingdom, United States and Canada to study the administrative procedures adopted in the control of biologicals under the Therapeutic Substances Act in force in these countries.

(d) Mr. K. V. Sundaram Ayyar, the Government Analyst, was deputed in December 1945 to United Kingdom, France, Switzerland, Ireland and the United States to study modern methods of food control and analysis.

3. *Establishment of a virus laboratory at the King Institute, Guindy, by the Government of India.*—A separate laboratory for the study of virus diseases is being established in the Institute by the Government of India and the buildings are nearing completion. The first task of the laboratory would be to manufacture yellow fever vaccine required for use in India.

4. *Technicians Training Scheme.*—(a) During recent years, the necessity for securing trained personnel in laboratory technique for appointment to such posts as technicians and laboratory assistants in several Government institutions has been very keenly felt. Training courses for these were started by the Government in their G.O. Ms. No. 1784, P.H., dated 26th June 1944. Training in general bacteriological technique is given in the Institute and in pathological and bio-chemical methods in the Madras Medical College. The first batch of trainees have now completed their training.

(b) At the request of the Sanitary Engineer to Government, a system of training waterworks personnel employed in municipalities in the operation of filters, methods of alum coagulation, chlorination and other water purification process has been started at the Government Experimental Filters, Kilpauk, and two batches of students have already been trained. The period of training extends to three weeks.

Officers deputed for training by other Governments.

During the period, several officers were deputed to the Institute for short periods for bacteriological training in general or training in any of the Institute's specialities. Officers so deputed were—

(1) Dr. Lin Fei-Ching deputed by the Chinese Government—19th May 1943 to 18th June 1943.

(2) Dr. A. Nimalasuriya, Medical Officer, Ceylon Government Medical Services, deputed by the Government of Ceylon—17th December 1943 to 14th January 1944.

(3) Mr. Kerala Varma, Bio-chemist, Government of Cochin—from 9th April 1945 to 8th July 1945 and again from 26th March 1946 to 25th June 1946.

(4) Dr. Azizur Rahman, M.B., D.P.H., deputed by the Bengal Government—training in vaccine lymph from 27th December 1943 to 25th January 1944.

(5) Dr. P. C. Baruah, deputed by the Government of Assam—training in vaccine lymph from 1st August 1945 to 31st August 1945.

(6) Dr. S. R. Omar, L.M.S.A., deputed by the Government of Gwalior—training in vaccine lymph from 1st September 1945 to 30th November 1945.

(7) Dr. R. C. Banerjee, M.B., D.P.H., deputed by the Government of Bhopal for training in vaccine lymph from 17th December 1945 to 12th February 1946.

(8) Mr. J. T. Mathew, Water Analyst, Corporation of Madras, deputed by the Corporation of Madras for training in water analysis—for a period of three months from 18th October 1945.

Visitors during the period from 1st October 1941 to 31st March 1946.

Her Excellency Viscountess Eugenie Wavell, Vicereine of India.

General H. H. Maharajadhiraj Raj Rajeshwar Narendra S. M. Sri Gangasinghji Bahadur, G.C.S.I., G.C.I.E., G.C.V.O., G.B.E., K.C.B., A.D.C., LL.D., Bikaner.

Dr. Mrs. Sivakamu, Principal Zenana Medical Officer, Women's Hospital, Bikaner.

Dr. R. G. Weingarten, Principal Medical Officer and Superintendent of Vaccination, Bikaner.

Hon'ble S. K. Basu, Minister-in-charge of Public Health, Government of Bengal, Calcutta.

Hon'ble Nawab K. H. Bahadur of Dacca, Minister of Agriculture, Government of Bengal, Calcutta.

Dr. B. Mukherji, Director of Public Health, Bengal.

Dr. R. B. Lal, Professor of Vital Statistics, All-India Institute of Hygiene and Public Health, Calcutta.

Prof. V. Subramanyan, Indian Institute of Science, Bangalore.

A. Hussain, Educational Officer, Government of India.

S. V. Ramamurty, C.I.E., I.C.S., Adviser to His Excellency the Governor of Madras.

Dr. S. R. Pandit, B.A., M.B.B.S., B.S.SC., Director, Pasteur Institute, Shillong.

C. A. Bozman, Lt.-Col., I.M.S., Additional Public Health Commissioner, New Delhi.

L. A. P. Anderson, Lt.-Col., I.M.S., Office of the Director-General, Indian Medical Service, Delhi.

Hon'ble Mr. Justice L. C. Horwill, I.C.S., High Court Judge, Madras.

S. H. Y. Onlsnam, I.C.S., Secretary, Government of India, Department of Education, Health and Lands, Delhi.

T. Austin, C.I.E., I.C.S., Adviser to His Excellency the Governor of Madras.

Delegates of the First Southern Army Pathological Conference led by Major-General H. C. D. Rankin, C.I.E., D.D.M.S., Southern Army.

R. L. Tuli, Director of Public Health, Central Provinces and Berar.

B. K. Sheoray, Lt.-Col., I.M.S., Assistant Director-General, I.M.S., New Delhi.

H. Wheatley, O.B.E., Director, Cinchona Department, Madras.

Lt.-Col. D. P. McDonald, I.M.S. (Retd.), Special Officer, Office of the Director-General, Indian Medical Service, New Delhi.

Dr. M. C. Balfore, Rockefeller Foundation, New Delhi.

Dr. W. P. Jacocks, Rockefeller Foundation, New Delhi.

Dr. Y. H. Ku, Chinese Educational and Cultural Mission.

Dr. T. C. Qu, Chinese Educational and Cultural Mission.

Dr. W. T. Wu, Chinese Educational and Cultural Mission.

T. L. Shen, Chinese Educational and Cultural Mission.

Joseph Ku, Chinese Educational and Cultural Mission.

Prof. A. V. Hill, M.B.F.R.S., Secretary of the Royal Society, London.

Dr. J. C. Fang, M.D., Provincial Health Commissioner, Kiangpi, China.

M. E. Herrington, Indian Section, British Information Services, New York.

Janet Corwin, Rockefeller Foundation, Hotel Cecil, Delhi.

A. Neuberger, Medical Research Council, London.

Dr. E. Desportes, Chief of Parasitology Department, Institute of Tropical Diseases, University of Paris.

L. S. Mathews, Director, The Welcome Foundation, London.

D. G. Davy, Biologist, Imperial Chemical Industries. Ltd., Manchester.

* J. B. Hance, Major-General, C.I.E., O.B.E., V.H.S., I.M.S., Director-General of Indian Medical Service, Delhi.

* B. Z. Shah, Lt.-Col., I.M.S., Superintendent, Mental Hospital, Poona.

* Rao Bahadur Dr. K. C. K. E. Raja.

* K. Subramanyan, Professor of Sanitary Engineering, All-India Institute of Hygiene and Public Health, Calcutta.

* Dr. J. B. Grant, Director, All-India Institute of Hygiene and Public Health, Calcutta.

* Dr. A. H. Butt, Director of Public Health, The Punjab.

* Prof. H. E. Sigerist, M.D.

* Prof. J. A. Ryle, Professor of Social Medicine, Oxford.

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* Members of the Health Survey and Develoment Committee and foreign medical experts.

* Dr. Janet M. Vaughan, N. W. London Blood Supply Depot.
* Dr. J. H. L. Cumpston, Director-General of Public Health, Australia.
* Dr. Sir W. Darlymple-Champneys, Ministry of Health, London.
* Dr. J. W. Mountain, M.D., United States Public Health Service, Washington.
* Prof. Bous Ogner, Chief Surgeon of the Peoples Commissariat of Public Health, Moscow.

2. Vaccine Lymph Section.

Charge.—Dr. K. V. Venkataraman.

Manufacture and issue of lymph.—The period under report opened with a balance of 125,340 gms. of crude pulp equivalent to 75,204 c.c. of glycerinated lymph issued to the field in a dilution of 1 in 7. 173,075 gms. were manufactured during the whole period distributed as follows:—

	GRAMS.
1941–42	29,550
1942–43	24,987
1943–44	32,260
1944–45	53,442
1945–46 (six months)	32,836

The large increase in manufacture during 1944–45 and 1945–46 was achieved by continuation of routine manufacture at full load through the summer months (when it has been the practice in previous years to suspend manufacture) and by increasing the number of calves dealt with to the maximum capacity of the accommodation at the Institute. This was necessitated by the greatly increased demands for vaccine lymph made on the Institute by the Public Health Department of this Province and to meet the requirements of the troops stationed in this area. Thirty-eight thousand, nine hundred and ten cubic centimeters of glycerinated lymph was supplied to the Government of Bengal in 1943–44 to help control the epidemic of smallpox which followed in the wake of the Great Famine. Also, 10,500 c.c. was supplied to the U.S. Army in 1945 to meet the requirements of U.S. troops in the India-Burma theatre, and 3,350 c.c. to the Director of Medical Services, Colombo, Ceylon, in 1943 for the control of smallpox in the island. The total quantity issued during the period was 923,589 c.c. glycerinated lymph (1 in 7 dilution) distributed as follows:—

	C.C.
1941–42	135,474
1942–43	130,083
1943–44	244,486
1944–45	272,816
1945–46 (six months)	140,730

The usual tests for conformity with bacteriological standards, toxicity and potency tests were done on all batches of lymph issued. The addition of 0.1 per cent clove oil to the lymph at the time of issue was continued until 25th March 1946. The stocks had by that time been greatly depleted and demands for vaccine lymph continued to increase, that by February 1946, it was noticed that it would not be possible to allow sufficient time for the action of glycerine in cold storage to bring down the viable bacterial content of lymph to acceptable standards before issue to the field. Treatment of lymph with chloroform vapour was resorted to in order rapidly to bring down the bacterial content and the addition of clove oil to issue lymph was omitted. All lymph issued after 25th March 1946 has been treated in this manner. The results obtained with this lymph in the Madras Corporation and in other municipalities has been closely observed for the subsequent six months, and found to be very satisfactory. In Madras the case success rate has been 99·8 per cent and insertion success rate

* Members of the Health Survey and Development Committee and foreign medical experts.

92·5 per cent. The corresponding figures for other municipalities are 98·4 per cent and 90·0 per cent.

The practice of testing representative samples of different lots of vaccine before " batching ", in the primary vaccination of children in the experimental range was continued, but on account of the diversion of the field staff to more urgent work the number of children observed during 1943–44 and 1944–45 was fewer than usual, and greater reliance had to be placed on the results of laboratory tests.

2. *Total vaccinations and types.*—During the period, a total of 16,613,178 vaccinations were done of which returns were received at the time of compilation. Of these 22·69 per cent were primary, 0.74 per cent secondary and 76.57 per cent re-vaccinations. The figures for each year are as follows:—

Year.	Total number of vaccinations.	Primary vaccinations. PER CENT.	Secondary vaccinations. PER CENT.	Re-vaccination. PER CENT.
1941–42 ..	3,871,466	32·57	0·97	66·46
1942–43 ..	3,002,557	26·8	0·5	72·7
1943–44 ..	2,188,510	27·0	0·4	72·6
1944–45 ..	5,963,287	13·6	0·7	85·7
1945–46 (six months.)	1,587,358	18·6	1·5	79·9

There was no cessation of routine vaccination during the summer months of 1944 and 1945.

3. *Primary vaccinations.*—The total number of primary vaccinations verified (included in the returns received) with case and insertion success rates are given below:—

Year.	Total number of primary vaccinations.	Case success rate. PER CENT.	Insertion success rate. PER CENT.
1941–42	1,261,104	97·3	88·0
1942–43	803,834	98·4	91·4
1943–44	592,003	95·6	86·2
1944–45	664,862	87·7	70·9
1945–46	251,091	92·7	76·4

The low case and insertion success rates for 1944–45 are probably not unconnected with the lack of adequate experience of the large number of temporary vaccinators who had had to be employed during the widespread epidemic of smallpox. The corresponding figures for the Madras Corporation 99·6 per cent and 93·4 per cent would indicate that the potency of lymph issued during the period continued to be satisfactory. The question of maintenance of adequate potency of lymph during transit and its utilisation in the districts is of sufficient importance to merit further investigation which it is hoped to undertake with the co-operation of the Director of Public Health.

4. *Re-vaccinations.*—The total number of re-vaccinations of which returns were received and the case success rates during each year are as follows:—

Year.	Re-vaccination.	PER CENT.
1941–42	1,854,126	20·1
1942–43	1,511,003	21·4
1943–44	1,196,415	36·7
1944–45	3,453,000	14·9
1945–46 (six months) ..	871,507	15·5

The steep rise in the case success rate for re-vaccination in 1943–44 and the subsequent steep fall to levels lower than recorded during the previous ten years are of interest to note. The reasons for this are not clear and the high percentage of lymph unaccounted for in the returns received makes it difficult to point with any degree of accuracy to the factors contributing to the steep rise and still steeper decline. It has been noticed however that there has been a gradual decline in the number of re-vaccinations reported from 1939–40 till 1943–44 when the very high success rate of 36·7 per cent was recorded. The steep decline coincides with the great increase in the number of re-vaccinations done during 1944–45, when, as has been mentioned before, it became necessary to employ a certain number of temporary vaccinators with inadequate experience. It would be interesting to follow the trend in the case success rates in

re-vaccinations during the coming years. It may be noted here that in the Madras Corporation the re-vaccination success rate has been consistently low.

5. *Lymph unaccounted for.*—A considerable proportion of the lymph issued from the Institute remains unaccounted for in the returns received. The figures for each year are as follows:—

Year.	PER CENT.	Year.	PER CENT.
1941–42	19·4	1943–44	77·2
1942–43	38·5	1944–45	56·1

The necessity to carry on mass vaccination for the control of severe epidemics probably did not permit of sufficient time for the health staff to submit returns of vaccinations done in all cases. Anyway the absence of returns for the greater part makes assessment difficult and it is hoped that greater attention will be paid to the necessity for the verification of results and submission of reports in future. The details regarding primary and re-vaccination results and other details in several districts of the Province for the period 1st October 1944 to 31st March 1946 are given in Table No. III.

6. *Supply of seed lymph and training of officers.*—Seed lymph was supplied periodically to the Vaccine Department, Mercara, Coorg and occasionally to the Vaccine Institute, Calcutta, Vaccine Department, Shillong and the Vaccine Institute, Bhopal. Training in the methods of manufacture and testing of vaccine lymph was given to the medical officers deputed by the Government of Bengal, Assam and the administrations of Gwalior and Bhopal States.

7. *Researches.*—The field experiments initiated in 1940 to ascertain the relative value of chick membrane lymph and routine calf lymph were continued. Re-vaccination of cases primarily vaccinated with these two types in 1940–41 with the homologous type of vaccine four years later was done in 1944–45 to assess the degree of immunity to vaccination conferred by these two methods. A comparative study of the extent and severity of reactions for the two kinds of lymph was also made. The experience of the two groups during a subsequent epidemic of smallpox has also been analysed. The results are reported separately.

3. Diagnostic Department.

Charge.—Dr. N. Seshadrinathan.

The number of examinations conducted for City and district hospitals and Public Health authorities during the period from 1st October 1944 to 31st March 1946 totalled 13,082 including microscopical and cultural examinations as well as samples of blood received for agglutination tests. During the same period 166 specimens were received for histopathological examination. Total number of bloods examined by Kahn and Wassermann Tests was 81,206. The details as to the nature of several examinations conducted are given in Table No. V.

Issues of autogenous and stock vaccines for therepeutic purposes amounted to 103,409 doses. Details are given in Table No. IV.

The number of examinations done have shown little variations from year to year since 1941, as will be seen from the table below:—

Serological Tests.

Year.	Total number of serological tests.
Year ending with 30th September 1942	46,600
Year ending with 30th September 1943	54,006
Year ending with 30th September 1944	47,113
Year ending with 30th September 1945	42,561
Half year ending with 31st March 1946	29,622
Grand total ..	239,902

Tabular statement showing the Pathological specimens examined in the Clinical and Pathology sections, King Institute, Guindy, from 1st *October* 1941 *to* 31*st March* 1946.

	For the year ending				For the half-year ending
	30th September 1942.	30th September 1943.	30th September 1944.	30th September 1945.	31st March 1946.
Clinical Section ..	11,627	10,362	9,521	8,913	4,169
Pathology Section ..	146	115	133	131	35
Serological Section ..	46,600	54,006	47,113	42,561	29,622

The section maintains a stock of special cultures for the use in the preparation of therapeutic vaccine as well as cultures of special interest. Cultures of typhoid bacillus typed for phage action have been added to this stock.

Diagnostic sera for important pathogenic bacteria are being prepared as a routine in order to meet the demands of the Institute as well as other laboratories in the Province. Similarly, other reagents like bacterial suspensions for use in agglutination tests are also prepared and supplied to institutions. Twenty strains of C. diptheria isolated from cases have been studied during the period 1st September 1944–March 31st, 1946. With a view to classifying them into Mitis, Gravis and Intermedius, bio-chemical reactions and guinea pig inoculations were resorted to. Three strains belonged to Gravis type, five to the Mitis type and the rest to the Intermedius type. All the three gravis and nine intermedius were virulent to guinea pigs on inoculation; one intermedius type strain was negative and in the case of the other two, guinea pig inoculation was not done. The Mitis strain were all avirulent to guinea pigs.

The serology section dealt with the blood samples and cerebro-spinal fluids for Wassermann and Kahn reactions and cerebro-spinal fluids for Langes test. Tabular statements giving the number tested with results are shown separately. The following are some of the special features for the period under review:—

(*a*) *Kahn verification test.*—For the detection of false positive reactions in the Kahn test the differential temperature technique was adopted in 1941 and has been followed since. It is now being adopted as a routine test in this Institute.

(*b*) *Victoria Blue test for syphilis.*—The antigen was prepared and a few tests (200) were carried out and the results were found to be satisfactory. However this was not adopted as a routine test.

Manufacture of Reagents.—Kahn antigen was prepared on a small scale at first from fresh bullock hearts obtained from the local butchery. This has become a regular feature and has been carried out all through these years on a much larger scale. Kahl-Baum's cholesterol used for the fortification of Kahn antigen was not available during the war. Experiments were conducted with other available brands of cholesterol. B.D.H. and Difco brands were found suitable.

The reagents used in the Wassermann test were also manufactured and supplied to various institutions. Anti-sheep cell amboceptor was prepared by immunising rabbits with 6 per cent sheep cells following the principle of primary and secondary stimuli. The rabbits were given two injections 3 c.c. and 5 c.c. of 5 per cent cells and then were allowed to rest for 2–3 months. The animals received a series of secondary injections after which they were bled and serum separated. Amboceptors of high titre were obtained by this method.

Supplies of reagents for serological tests were made to various private and Government laboratories during the period under review. The demand for Kahn antigen though great, was fully met with. In order to ensure that the antigen issued from the Institute has proper sensitivity and specificity every batch of antigen prepared in this Institute was checked with Difco standard antigen on a sufficient number of blood samples. A clinical check was also adopted. A number of bloods received from the Venereal disease department of the General Hospital were selected and tested with the antigen prepared and the results compared with clinical findings obtained from the General Hospital Venereal department.

In arriving at the titre for Kahn antigen apart from the method described by Kahn, a simpler and equally reliable method has been followed. The results were checked with the figures obtained by the usual method and it has been found that the new method is reliable and satisfactory. A short paper regarding the method adopted has been submitted for publication.

4. Prophylactic Vaccine Section.

Charge.—Dr. M. Narayana Pai.

The work of this section has shown a marked increase during the period under review. The average issues of cholera vaccine previously were about 1 million doses or less per year except during the year 1936–37 when 2½ million doses were supplied. But in the period under review the issues were as follows:—

1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1st October 1945 to 31st March 1946.
1,898,162	4,083,211	11,137,414	7,010,844	6,925,910	2,421,027 doses.

The high figures in 1942–43 and 1943–44 were due to the unusual prevalence of cholera in the Presidency. In the year 1943–44 1·1 million doses were supplied to the Government of the Central Provinces and Berar and 1 million doses to the Government of Bengal. In the year 1944–45, 3·15 million doses were supplied to the Central Provinces and Berar. This sudden and heavy demand for cholera vaccine threw a great strain on the staff of the Institute.

T.A.B. vaccine was also manufactured and supplied to the Province. Plague vaccine was obtained from the Haffkine Institute, Bombay, and supplied to the Public Health authorities in the Province. The quantities issued during successive years are given below:—

	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1st October 1945 to 31st March 1946.
T.A.B. Vaccine in c.cs. ..	116,053	136,188	136,724	122,136	144,757	41,875
Plague Vaccine ..	899,320	517,140	1,119,780	985,460	1,105,460	664,820 doses.

The manufacture of cholera bacteriophage and dysentery bacteriophage for issue to various hospitals, private practitioners, etc., was also undertaken in this section. The preparation of cholera bacteriophage however was discontinued in 1944 and the manufacture was restricted to dysentery bacteriophage only. The statement given below gives the quantities issued:—

	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1st October 1945 to 31st March 1946.
Cholera Bacteriophage in c.cs.	16,200	4,480	13,720	840	Not manufactured.	
Dysentery Bacteriophage in c.cs.	20,001	8,985	9,585	8,877	7,860	1,053 c.c.

5. Sterile Solution Section.

This section was started in August 1941. The hospital authorities in the Province were experiencing considerable difficulties in obtaining pure chemicals for the preparation of injectable solutions for therapeutic purposes. It was considered desirable to centralize this activity in the Institute. The issues were restricted to such essential solutions as glucose, calcium chloride, sodium oxalate, pyrogen free saline and distilled water. In 1941, quinine bihydrochloride ampoules were also put up and issued. A supply of 85,500 ampoules of nikethamide solution was also made during that year to the Medical Stores Depot, Madras. In 1943–44, 31,320 ampoules of quinine bihydrocholride were supplied to the military authorities.

In addition to the routine supplies requests have been received very frequently from medical officers in Government institutions for special supplies of such solutions as percain hydrochloride, morphia, procaine, atrophine sulphate, novocaine, ephedrine, etc. The drugs were supplied by the indenting authorities and the requests were always complied with. The total issues made during successive years from 1941 are listed in Table No. V-B.

6. Department of Antitoxins.

Charge.—Dr. M. K. K. Menon.

The activities of the Serum Standards Laboratory sanctioned by Government in 1941 were further extended by the establishment in 1943 of a regular "Department of Antitoxins" for the purpose of manufacturing essential Biological products required by Government Institutions in the Province for prophylactic and therapeutic purposes. In their G.O. No. 269, P.H., dated 1st February 1943, the Government had also sanctioned the construction of the necessary buildings for this purpose. The execution of the building programme had to be delayed, however, owing to the conditions created by the war. Considerable difficulties were also experienced in getting the necessary special apparatus from abroad. However some had to be improvised in the laboratory and some were made by local manufacturers. A beginning was, however, made and a small scale production of antitetanic and antigas-gangrene sera was launched. The Director of Veterinary Services and the Principal, Veterinary College, Madras, very kindly agreed to place at the disposal of the Institute such stable accommodation as it was possible for them to spare to house the Institute horses. As the number of horses increased additional stable accommodation was secured close to the Veterinary College through the courtesy of the S.P.C.A. The help and co-operation thus rendered by the Veterinary department were found to be most valuable in the early stages of the scheme.

Soon after the termination of the war, the Government sanctioned the construction of the laboratory block to provide necessary accommodation for all the growing activities of the department. The building is now nearly completed and will be ready for occupation as soon as the required cold storage and air-conditioning equipment have been installed. Till such time the work of the department has to be carried on with great difficulty. Early in 1945 the department successfully produced Tetanus Antitoxin (curative serum) freed to a considerable degree from all other non-specific proteins and with a potency of 4,500 international units per c.c. The total solids in the serum produced was about 10 per cent (the maximum permitted by the regulations being 20 per cent) showing that a high degree of specific refining had been attained. The potency and total solids were confirmed by other Antitoxin Laboratories. The product thus compared favourably with any such imported from abroad. The various activities of the department are summarized below.

Horses.—The Veterinary section of the department started with 8 horses in 1943. As the work progressed 10 more were added in 1944 and another 8 were added in 1946. The department thus possesses now 26 horses. This number is quite inadequate to meet the full requirements of the Province. But it is regretted that this number cannot be increased for want of stable accommodation. The horses are under immunisation as follows:—

	Under immunisation.	Under bleeding.	Total.
Tetanus antitoxin	7	9	16
Gas-gangrene Antitoxin (perfringens) ..	3	3	6
Vibrion septique ..	1	1	2
Œdematicus ..	1	1	2

Thus it will be observed that larger number of horses are put under Tetanus as the demand for this Antitoxin is far in excess of any other serum.

Toxins.—The work of maintenance of various toxigenic cultures and the preparation of toxins for immunisation of horses is being conducted in the Anaerobic section of the department. The table below shows the various lots of toxin prepared:—

Period	1942	1943	1944	1945	1946 (up to March 1946)
Tetanus toxin ..	100 litres	132	136	210	50
Gas-gangrene toxin (perfringens) ..	20	40	86	117	20
Vibrion Septique toxin	..	20	80	48	18
Œdematicus toxin..	..	20	80	51	18

Toxoids.—Preparation of tetanus toxoid for active human immunisation was also attempted. About 3 litres were prepared in 1943. Many batches were discarded as they did not satisfy the minimum antigenic requirements. So far there has not been much demand for this product. Recently a further lot of 2 litres has been prepared and will be considered for issue as soon as the necessary tests have pronounced it satisfactory.

Antitoxins.—The serum concentration section of the department conducted the concentration and purification of all the antitoxins. The method adopted for concentration was the ammonium sulphate precipitation technique followed by further purification of the specific pseudo globulins by Iso-electric precipitation. The total volumes of plasma both tetanus and gas-gangrene processed during the respective periods are shown below:—

Year.	Total volume of plasma processed (in litres).
1943	36
1944	181
1945	181
1946 (up to March)	73

Issues of sera manufactured in the Institute.—The following table shows the amount of serum manufactured by the department and issued for use. The final ampouling and issues of sera are made by the serum filling section of the department.

Year.	Tetanus antitoxin.	
	Prophylactic.	Curative.
1944	Nil	98 ampoules of 20,000 units each.
1945	1,395 ampoules of 3,000 units each.	Nil.
1946 (up to March)	2,572 ampoules of 3,000 units each.	Nil.

Quite a large number of lots of tetanus and gas-gangrene antitoxins were manufactured during the report period but were brought to issues only after March 1946. Besides the above work, a large amount of biological products were purchased from various commercial companies in India and outside India and issued by the serum filling section of the department. The Table VI shows the various products issued.

Provincial requirements of sera.—The total annual requirements of anti-tetanus and antigas-gangrene sera for the various medical institutions of the Province are shown below:—

Tetanus antitoxin.		Gas gangrene antitoxin.	
Prophylactic.	Curative.	Prophylactic.	Curative.
120,000 ampoules of 3,000 units each.	10,000 ampoules of 20,000 units each.	2,000 ampoules.	1,000 ampoules.

It has not been possible yet for the department to manufacture the full provincial requirements of the sera. As stated before the department has been carrying on the work with considerable difficulty for want of suitable laboratory accommodation, cold room and air-conditioned room. About 30 litres only of crude plasma can be taken at a time for processing with the accommodation and equipment now available. Consequently about 421 litres of tetanus antitoxin and 143 litres of gas-gangrene antitoxin are awaiting concentration.

Furthermore in accordance with the international agreement the prophylactic dose of tetanus antitoxin has been raised from 1,000 to 3,000. Consequently the provincial demand for the prophylactic serum has trebled. Once the new buildings are made available for use and stable accommodation provided for increased number of horses it would be possible to step up production of sera considerably. Some more special apparatus has also to be obtained from abroad and the staff of the department augmented to secure increased production.

Biological standardization.—The number of biological assays done on anti-toxins manufactured in the Institute as well as on commercial sera purchased are shown below; Guinea-pigs, white mice and pigeons were the chief laboratory animals used—

Chart on Biological standardization (number of assays done).

Period.	Tetanus antitoxin.	Gas-gangrene (perfringens).	Vibrion septique antitoxin.	Œdimaticus antitoxin.
1941–42 ..	21	..	..	..
1942–43 ..	29	18	5	..
1943–44 ..	45	94	8	6
1944–45 ..	66	85	9	9
1945 to March 1946	33	39	1	1

Manufacture of "Working Standards".—One important feature of the work in the Standardization Laboratory consisted in the manufacture in 1945 of standard tetanus and standard gas-gangrene antitoxins comparable in every respect with the "standards" issued by the Department of Biological standards, Medical Research Council, London. The manufacture of these "so-called" working standards though laborious and involving the use of a large number of animals, made it possible for us to conduct any number of biological standardization tests while at the same time conserving the Medical Research Council standards for the final tests.

Help rendered to other sections of the Institute.—The anaerobic section continued to give help to the diagnostic and other sections of the institute in the detection and identification of anaerobic spore bearers in samples of material sent for this purpose.

Special research.—Research work on a number of problems pertaining to the department is being carried out in addition to the usual routine work. Attempts are being made to produce a highly potent tetanus toxin by proper adjustment of the nutritional requirements, particular attention being paid to fix the optimum amount of iron as it has generally been accepted that iron plays an important part in the production of potent toxins.

Toxin powder.—Perhaps this is the only antitoxin laboratory in India where dry toxin powder is used for conducting biological standardization tests. A method has been perfected for the preparation and preservation of toxin powder in vacue on the same lines as adopted in the National Institute of Health, Washington D.C. with slight modifications.

Ramon's Flocculation tests.—Studies were conducted on Ramon's Flocculation tests with tetanus toxoid and antitoxin with a view to evolve out a method of standardization of tetanus antitoxin. Though no double zone flocculation occurred with the antitoxin supplied by Prof. Ramon in Paris, double zones were a frequently occurring phenomenon in our experiments with the toxoid and antitoxin manufactured here. Hence no satisfactory method of standardization could be worked out.

7. Blood Bank.

Charge.—Dr. K. S. Ranganathan (from 1st May 1943 to 18th January 1946).
Dr. C. Sriramachandra Rao (from 19th January 1946 onwards).

1. *General.*—In April 1941, the Surgeon-General with the Government of Madras requested the Director to take steps to establish a Blood Bank in the Institute primarily as an A.R.P. measure, and to build a reserve of plasma for the treatment of emergency casualties. With such equipment as was available in the Institute a start was made with the student volunteers kindly provided by the Principal, Y.M.C.A. College of Physical Education, Madras, and with donors obtained by the Indian Red Cross Society, Madras Branch. Further help was rendered by the Inspector-General of Prisons, Madras, by obtaining permission of the Government to call up volunteers from the prisoners in jails. The prisoners who thus volunteered were given some concession and a small monetary reward.

However the paucity of donors was being keenly felt. The stock of plasma so prepared was not sufficient and at the same time the demand for blood and plasma from the City hospitals was rising. An efficient organization was needed

to augment the supply of donors. The Surgeon-General with the Government of Madras appointed a Blood Transfusion Committee for the purpose. The Committee included a representative of the Indian Red Cross Society, Madras Branch.

Intensive propaganda was carried out to educate the public on the usefulness of blood transfusion and on the harmlessness of blood donation. The Blood Bank put up exhibits on Blood Transfusion at the Science Exhibition held at the Madras Medical College in August 1942. Appeals were made to the public regularly in the press, articles were published in magazines, such as the *A.R.P. Journal* and *St. John Ambulance Gazette* and talks were given over the radio, besides talks and lectures given by the convener and members of the Blood Bank, Publicity Committee and by the medical officers of the Blood Bank. The Blood Bank took part in the War Services' Exhibition held in Madras in 1943. Leaflets in Tamil and English generously got printed by the Red Cross Society were freely distributed to the public.

The example of the Calcutta Blood Bank in presenting donors with badges was adopted in 1943. The Government were pleased to sanction the payment of a conveyance allowance of Re. 1 to each donor to enable him or her to return home or to work in a conveyance after blood donation.

To further augment the supply of donors the Government appointed some prominent and influential members of the public of Madras representing various interests as members of the Blood Bank Committee. The A.R.P. Controller undertook the publicity work of the Blood Bank.

2. *Organization.*—For the convenience of the donors in the City of Madras, a centre for the examination of donors and for the collection of blood was opened in the Denison Ward in the Government General Hospital, Madras. The mobile team from the Blood Bank at the Institute visited the hospital on four days in the week for accepting blood donations. The number of visits was reduced later to three per week.

In addition to the routine visits to the Government General Hospital, the mobile team visited and collected blood from volunteers at their own premises whenever a sufficient number of donors, a dozen or more, volunteered. Several commercial firms, Government offices, factories, clubs, A.R.P. depots, railway offices, college hostels, etc., in the City of Madras took advantage of this facility and it is interesting to note that the majority of blood donations were accepted at such visits.

These visits were later extended to places within reach of Madras by motor van, for which purpose the Government permitted the use of an A.R.P. Ambulance. In 1942 the team visited Arkonam (40 miles from Madras) and Central Jail, Vellore (90 miles from Madras). The blood collected in these places was transported to the Institute in insulated ice-boxes by road and sometimes by rail without any deterioration of blood.

A new feature of 1943 was the periodic visits of the mobile team to different centres in the Chingleput district for the purpose of collecting blood. These visits were organized by Mrs. H. K. Philip, Lady Lecturer under the National War Front.

Vellore was another place of regular visit by the blood bank team. In 1943 the donors were chiefly from the Central Jail. In 1944 additional visits to this place were organized through the kind co-operation of Mr. Abdul Khyoom Sahib, the District Education Officer, North Arcot. The donors were mostly village school teachers from the different parts of the district and also members of the police force.

To accept such donations and to process the plasma, the Government had sanctioned a staff of three civil assistant surgeons and necessary subordinate staff. As during the emergency blood banks had to be started in certain district centres also the Government appointed in 1943, a Blood Transfusion Officer to co-ordinate the activities of the various blood banks.

3. *Technique.*—A thorough medical examination of the prospective donors was made. Volunteers who were poor in health and weight, low blood pressure and who had recent illness were not accepted. About 5 per cent of the donors

had mild syncopal attacks after the blood donation. It is interesting to note that these attacks were fewer among the villagers than in the townsmen.

After a careful selection of donors the blood was collected from them by gravity in a closed system into a standard M.R.C. blood bottle containing solution of sodium citrate in pyrogen free distilled water. After the blood was collected the bottle was immediately capped, numbered and placed in the chest to be transferred to the institute where it was stored in a frigidaire at a temperature between 2°C and 4°C. Blood grouping and serological tests were done on samples of blood collected from each donor in separate tubes. When whole blood was required Kahn negative blood was issued with a pilot tube for cross matching purposes.

After five days by which time the sedimentation of cells is more or less complete, the supernatant plasma was syphoned off by a close method in Winchester quart bottles, the plasma from at least 15 bottles being used for each pool of 3,000 c.cs. Till the end of 1942 the plasma which was thus pooled was immediately bottled by a close method into sterlie bottles in units of 250 c.c. each. Aerobic and anaerobic sterility tests were put up and the bottles stored in the cold. Plasma prepared in this manner was used up within six months.

By the end of 1942 equipment for bacterial filtration of plasma became available and the processing of plasma after preliminary clarification through paper pulp and subsequent filtration through seitz pads was introduced. The processed plasma was collected in 500 c.c. standard blood bottles and stored. The alkali $Co2$ neutralization method (Bushby and Whitby) was adopted and has proved quite satisfactory in practice. The time-limit for the use of plasma is one year from the date of processing. It was observed that filtered plasma after storage for sometime showed a cloudiness which sterility tests proved to be not due to bacterial contamination. It is due to aggregation and precipitation of the residual lipoid globulin complex. The usefulness of the plasma is in no way affected by it although the plasma has to be filtered before use.

Salvage of red cells.—The red blood cells that were left behind after separation of plasma were again suspended in 5·0 per cent glucose saline. The reconstituted blood, after it was subjected to sterility tests was issued to the hospitals for use in cases of anæmia. Table No. IX-A shows the amount of plasma and blood thus prepared and used.

Clinical results of plasma transfusion.—The blood plasma was used in the hospitals for the treatment of post operative shock following the hæmorrhage, injuries, burns, etc. In nearly 20 per cent of the cases used it has given excellent results where lives were undoubtedly saved and in more than 50 per cent the results were good. For the other cases it is probable that the plasma was administered rather late when irreversible changes had already taken place.

Table No. IX-B gives the number of blood and plasma transfusions each year.

Donors.—The number of visits by the mobile team to different centres and the number of donors accepted are given in Table No. IX-C. Their distribution according to sources is shown in Table No. IX-D and the distribution according to communities, etc., in Table No. IX-E.

Distribution of blood groups among the donors.—Every sample of blood collected was grouped except when the rush of donation was heavy. The tube method of grouping was substituted for the slab method which was in use till the end, 1943. The percentage distribution of the blood groups among donors is given below:—

Table showing the distribution of blood groups.

	Number of donors.	Percentage of distribution of blood group.			
		O	A	B	AB
Hindus ..	3,442	38·4	22·9	32·0	6·7
Christians ..	471	39·5	17·4	36·7	6·4
Muslims ..	389	35·5	19·5	36·3	8·7
Europeans ..	307	45·0	38·4	11·4	5·2
Anglo-Indians ..	145	43·4	29·7	21·4	5·5

Blood-grouping sera.—Blood-grouping sera were prepared and supplied to the various Government hospitals and other private hospitals (Table No. IX-F). These group sera A and B are coloured with dyes acriflavine and brilliant green respectively, so that they are preserved better and at the same time the distinctive colour permits easy identification of the group serum. Attempts were made to dry the blood-grouping sera completely by the lyophile process. The dried product without refrigeration is being tested for potency every month and compared with that of the wet serum stored in frigidaire. The results have been encouraging. The use of dried serum will be recommended for places where refrigeration is not available.

Training of medical personnel.—Systematic education of medical officers in blood transfusion and resuscitation was undertaken in the institute periodically in batches. Doctors from other States and provinces were also deputed to undergo this training by their respective Governments. In all nearly 40 medical officers have received instructions in the blood bank technique in all its aspects.

Research.—A short note on the incidence of the Rh factor in Madras is given in Part II "Researches."

8. Department of Water Analysis and Algae Control.

(*Public Health Section.*)

Charge.—Sri Rao Sahib T. N. S. Raghavachari, B.A. (from 1st October 1941 to 9th April 1943). Sri P. V. Seetharama Ayyar, M.A., from 10th April 1943 onwards.

This section was designated as the Public Health Section in previous reports. Other sections of the institute also do work of a public health nature. Therefore, to signify correctly the type of work carried out in this section, it would be more appropriate to designate this section as the "Department of Water Analysis and Algae Control." The bacteriological, chemical and microscopic examination of water for potability and for industrial, agricultural and non-domestic uses, the analysis of sewage and trade wastes for the determination of proper treatment and disposal methods, the control of algae and other aquatic plant and animal organisms, the analysis of chemicals and other materials used in water purification processes, testing of disinfectants, the testing, preparation and supply of biological stains and special media, form the main routine work of the department. Problems connected with medical zoology continued to be dealt with by the department as during previous years, pending the constitution of a separate section of medical zoology.

A special staff of one Junior Assistant and necessary laboratory assistants was sanctioned in 1944, for studying the bacteriological quality of milk produced under local conditions, in connexion with a scheme for the fixation of "tentative" bacteriological standards of market milk. The scheme for the study of the larvicidal properties of vegetable oil blends was placed under the administrative control of the Director, King Institute, in November 1944 and the research on this problem was also carried out at the laboratories of this department.

The enormous increase in the work of the section as a result of the war and other factors necessitated the strengthening of the staff by the addition of one Public Health Junior Assistant and a sample taker.

The department in its present form comprises five sections, the last two being temporary research units. These are (1) water bacteriology, (2) water chemistry, (3) water biology, (4) milk bacteriology, (5) medical zoology (vegetable oil larvicide research). In addition, the Government Experimental Research station at Kilpauk and the laboratory attached to it also form part of this department.

General.—At the end of March 1946, a total of 149 water supplies was under periodic examination (Table No. VIII). Of the surface water sources, 9 are obtained from impounding reservoirs, 23 from rivers and streams, and 5 from tanks. Sixty-six supplies derive their water from wells, and 46 from infiltration galleries. Chlorination was the only treatment applied to the gallery and well supplies while the surface sources were filtered and chlorinated. Nine municipalities, 3 jails and 20 railway stations employed automatic chlorinating apparatus;

in 62 others, chlorination was hand controlled, while 55 supplies were not chlorinated.

The periodical examination of samples from the water supplies to Ernakulam, Trichur and Mattancheri in the Cochin State was undertaken in 1945 at the request of the Cochin Government. The water-supply to Annamalainagar and the Annamalai University was also included for routine examination in the same year at the request of the university authorities.

The water supplies to Gudalur Panchayat Board, Government House, Guindy, Kumbakonam Municipality, Papanasam Project, Bodinayakkanur and Kotagiri Panchayat Board were also added recently to the list of supplies examined periodically at the institute at the request of the Director of Public Health and the Sanitary Engineer.

The total number of samples examined from all the sources during the year under report is given in a separate statement (Table No. VII). It will be seen that there has been a sharp rise in the volume of work relating to water examinations. This increase occurred under nearly all heads. The experimental filter station provided a very large number of samples for analysis indicating the increased activity at this research station. The number of samples received from the rural water supplies decreased steadily during this period as a result of the policy adopted by the Public Health department of sending samples for analysis only when local tests indicated that the water was either brackish or was unsuitable for cooking rice and dholl, for determining if such waters were otherwise satisfactory. A large number of water samples were also analysed in connexion with investigations on new water-supply schemes in different parts of the Province.

The number of samples of water examined at the request of the military authorities, increased markedly during these years. The nature of the assistance rendered to the armed forces in this and other matters is referred to in detail in a subsequent section of this report.

Samples of water were also received for test regarding their suitability for use for non-domestic and industrial purposes, and for the determination of correct methods of conditioning. The nature and variety of work on this aspect of water examination is shown in Table No. VII, Part I (*c*). Waters were analyzed to test their suitability for (1) boilers, (2) cooling engines, (3) manufacture of ceramics, paper and rayon, (4) electro-plating, (5) leather tanning, (6) laundering, (7) pisciculture, (8) fruit and fruit juice preservation and the canning industry, (9) meat and vegetable dehydration factories, (10) vegetable cultivation and crop irrigation. The number of such samples has increased particularly since 1943 [vide Table No. VII, Part I (*c*) indicating the growing realization among manufacturers of the importance of water quality in industrial processing.

The analysis of samples of alum, lime, bleaching powder and other materials employed in water treatment was carried out on behalf of the Government and the local bodies.

Problems in connexion with treatment and disposal of sewage and industrial wastes were investigated and samples of sewage, sewage effluents, and factory wastes were analysed for evolving suitable methods of treatment and disposal. With the limited resources of technical personnel and time however, only a small number of samples could be analysed. This special branch of work has gained importance during recent years from the aspect of prevention of water pollution, and would naturally increase considerably in the near future as a result of greater industrialization, and the provision of sewage disposal for municipalities. The periodical examination of sewage and sewage effluents and industrial wastes should therefore be organized on lines similar to that of the protected water supplies.

A study on the bacteriological quality of milk produced under varying conditions of cleanliness was started in 1944 with a view to the fixation of tentative standards for cleanly produced milk. A preliminary report has been drawn up and forwarded to the Government. A brief note on the salient features which affect the bacterial quality of the milk samples is given under "Researches" (page 79).

The control of algal growths in water supplies by the application of coppor sulphate, chlorine and ammonia singly or in different combinations has been adopted and found to be effective in destroying established growths and in preventing development of algae. The dose of algicide and line of treatment were determined after a field study of the nature and intensity of the growths, their susceptibility at different stages in their life-history, and on the chemical features of the water. The surveys and analytical studies were conducted in the temporary laboratory established in the field, and the treatment carried out under the guidance of the special staff from the institute. The adoption of systematic algal control measures has helped in keeping waters formerly heavily infested with algal growths free from such abundance of offending organisms and has contributed towards the proper functioning of settling basis and filters. Taste and odour troubles have also been overcome. Algal control measures were first adopted in Salem, Cocanada, Ellore and Chidambaram municipal water-supplies and have not been extended to Adoni, Arisipalayam, Calicut, Dindigul, Godavari, Negapatam, Yemmiganur and other supplies. At the institute, samples of water collected periodically from the water supplies are examined microscopically as a routine. [Table No. VII, Part I (*d*).]

The special technical facilities available at the institute for work on aquatic biology were utilized by the other departments of Government and Industrial bodies for tackling problems arising from organic growths in waters.

The experiments at Kilpauk during the years under report were mainly on methods of conditioning the raw water before filtration and on sterilization of the filtered water using chloramines instead of chlorine. Experiments were also carried out on filtration of Red Hills Lake water through gravity mechanical filters, for evolving working data for the large-scale installation planned by the City Corporation for their water-supply.

The descriptive form containing details of the sanitary survey of water supplies was modified in 1945 since the form in use until then was a composite one covering all types of water sources and its use resulted in waste of paper. The form was therefore split up into four separate ones, each covering the required information relating to one particular type of water-supply.

The manufacture of protein hydrolysate was started in February 1946 at the request of the Public Health Commissioner to the Government of India. The method of enzymatic digestion of meat with papain was adopted, and the digested meat was freed from undigested proteins and metaproteins by heat coagulation at ph 7.0—7.4. The final product was mixed with 5 per cent glucose and 0·85 per cent common salt, and sterilized. Biological and chemical tests were carried out to determine the purity of the mixture before it was supplied to hospitals.

At the instance of the Sanitary Engineer to Government, water works operators employed in the municipalities of Bodinayakkanur, Cocanada, Kurnool, Rajahmundry, Adoni, Ellore and Vellore were trained at the Government Experimental Filter Station, Kilpauk, Madras, and in the King Institute, Guindy, for a period of three weeks in the operation and maintenance of filters, water purification plants, chlorinating equipment, etc.

War work.—The Public Health Section was called upon to undertake various types of work on behalf of the military authorities during these years. The facilities available at the institute were fully utilized and help and advice on many subjects were given to the Land, Air and Naval forces stationed in different parts of the Province. To cope with the heavy demands made on the time and resources of this section, the section staff was also augmented.

While the samples of water from military sources are usually examined at the Brigade Laboratories, the advantages of getting expeditious reports from a well established and equipped laboratory situated at a central place were soon recognized by the defence forces stationed in areas around Madras and samples of water for examination were sent to the institute in preference to their own laboratories. A special sample taker was also appointed to help in the proper collection and transport of water samples from different military camps to

overcome sampling errors and to gather all relevant information regarding the source, etc., from which the samples were drawn. A close liaison was thus established between the military authorities in charge of camp water supplies and the institute. In all cases, samples of water received from the military sources received high priority and the analytical reports and necessary advice were sent to the authorities with the utmost expedition.

Besides the examination of the large number of water samples as stated above, the advice of the institute was sought on a variety of problems confronting the water works personnel. A few such problems are mentioned below:—

(a) The skeleton scheme drawn up by a firm of contractors for the provision of a swimming pool for the use of the military personnel in the Y.M.C.A. compound, Saidapet, was scrutinized and the improvements and alterations necessary were suggested. Advice was also given to the authorities concerned as regards the quality of the water, the method of purification needed and the nature of the post-filtration treatment for rendering the pool water æsthetically satisfactory and hygienically safe.

(b) At the request of the C.R.E., Madras, a detailed scheme for the supply of drinking water to the R.N.A.S. Camp, near Tambaram was drawn up after a personal inspection of the site at Anakaputhur. Advice was given on the location of the site and the nature of the treatment required for purifying the water of the Adyar river.

(c) In connexion with the establishment of meat and potato dehydration factories at Red Hills and at Mettupalayam, detailed instructions were given to the respective concerns on the proper design and working of the alum coagulation and settlement basins. Suggestions were also given on the proper method of alum treatment and chlorination of their water supplies.

(d) Emergency water supplies put up in various parts of the Province as A.R.P. measures, were tested and necessary advice was tendered for maintaining the safety of these alternative sources of supplies. The storage of water for purposes of fire fighting resulted in the development of profuse algal growths in many of them. This rendered the stored water unsightly. The health authorities were advised on the correct method of controlling these vegetable growths in the tanks.

(e) The Government controlled silk filatures at Kollegal which were supplying military needs requisitioned the help of the institute in connexion with their water-supply problem. A special field investigation was carried out to determine the best methods of softening the water to make it suitable for silk reeling purposes.

(f) In the Cocanada area, the military authorities had constructed fifty shallow wells for their use. These developed a high degree of caustic alkalinity due to the use of fresh cement blocks for steining. A personal inspection was made and suitable methods to overcome the trouble and render the waters palatable were suggested to the engineering authorities in charge.

(g) In addition to the examinations of samples relating to water supplies, chemical and bacteriological analyses of some miscellaneous samples such as milk—raw and pasteurised—milk powder, tinned foods, ærated waters, etc., were also carried out in the institute for the military authorities.

A special lecture and demonstration on the subject of fluorosis in South India were arranged for a group of Army Pathologists who visited the institute in October 1944. They also availed of the opportunity to familiarize themselves with the nature of the work carried out in the Public Health section relating to water analysis and water purification methods. Similarly, under the auspices of the British Medical Association, South Indian branch, a lecture on " Snakes of South India " was arranged at the institute, specially for the military medical personnel stationed in and around Madras.

In connexion with malaria control, numerous requests were received for the supply of the larvivorous fish " Gambusia," a flourishing colony of which is maintained in the fish nurseries in the institute grounds. Large numbers of these larvivorous fish were supplied in earthen pots to military camps.

An investigation was carried out at the granite quarries at Meenambakkam to assess the extent of risk to the workers by the granite dust suspended in the air near the drilling machine and the stone crushers, especially from the point of view of silicosis. Samples of dust were analysed and though the risk of silicosis was negligible, remedial measures to control the dust nuisance near the drilling and crushing machines were suggested for adoption.

Water analysis.—The periodical examination of the protected water-supplies of municipalities and panchayat boards, selected jails and important railway stations was, as usual, carried out three times a year during the period under report. The performance of the various types of water purification plants was studied and timely help and advice given to the local bodies on matters pertaining to difficulties met with in filtration practice, defects in plant operation, chlorination, alum dosage and other problems incidental to water purification.

A simplified method of confirmation for coliform organisms has been in use in this laboratory for some time and is employed for all special samples received for bacteriological examination. The sample of water is inoculated into the MacConkey's bile salt lactose broth as usual and incubated for 48 hours at 37°C. The results are read off and recorded. At the end of 24 hours incubation at 37°C, one of the positive tubes showing acid and gas is plated out on MacConkey's agar and after 24 hours incubation, six typical pink colonies are picked out for confirmation again in MacConkey broth and their staining reactions are also studied. If confirmed, these coliforms are further classified as fæcal coli, intermediates and ærogenes-cloacase on the basis of their Methyl Red, Voges and Proskauer and Indol reactions and their ability to grow in MacConkey broth at 44°C and in citrate broth at 37°C. Our experience justifies reliance on this procedure in the sanitary assay to potable waters. Further, there is economy in the use of chemicals—a point of vital importance under the present conditions.

It has been the practice in this laboratory in reporting on the coliform index of water samples, to estimate the smallest volume of water showing the presence of lactose fermenters. For critical research work, however, calculations were made on the most probable number of coliforms in 100 c.c. of water based on the inoculation of sets of five tubes each containing varying volumes of water (50, 10, 1 and 0.1 c.c.). This procedure has been followed in all the experimental work at the Kilpauk Research Station for some years and has yielded results sufficiently accurate for detecting delicate differences in sanitary quality between samples of water. This basis of estimating the coliforms in waters is now universally adopted and it is proposed to introduce it into routine work thus bringing our procedure also in line with the prevailing practice elsewhere.

The minimal dose method of chlorinating water supplies by introducing chlorine solution on the suction side of centrifugal pumps has been adopted by some municipalities which have recently electrified their pumping installations. The results obtained with this method of sterilization have been consistently satisfactory in all cases where the treated water is fairly clear and free from suspended matter. In one municipality adopting this method, deterioration was noticed in the bacterial quality of the treated supply and timely advice was given to the Municipal Health Officer to exercise greater control in the method of mixing and addition of the bleaching powder solution. Attention was also drawn to the fact that this method of chlorination was applicable only to waters whose physical appearance was satisfactory and that it was not advisable to exceed a dose of 0.2 ppm. of chlorine, if damage to pump parts was to be avoided.

Testing of disinfectants.—The number of tests on disinfectants carried out during 1943–44, reached the record figure of 181 (Table No. VII, Part II). This increase was mainly due to the great impetus given to the manufacture of disinfectants in India as a result of the non-availability of foreign brands due to war conditions. On account of the difficulty of obtaining suitable materials such as high boiling tar acids and other proprietary preparations usually added to the disinfectants by the manufacturers to enhance their germicidal value, the quality of the disinfectants put out by the various firms showed a marked

deterioration as judged by their germicidal value by the Rideal Walker test which is the officially recognized test in India to-day. Tests on the germicidal value of some high boiling tar acids and cashewnut oil were carried out on behalf of the Superintendent, Government Kerala Soap Institute, Calicut, who is attempting to put on the market a high grade disinfectant for general use. Two firms outside the Province—one from Ceylon and the other from Bihar—sent a large number of disinfectants for tests during the last four years. Some of the disinfectants sent by the Ceylon firm were also subjected to the Crown Agents test which is the approved test in the Crown colonies.

Miscellaneous examinations.—(Table No. VII, Parts II and III). The quantity of standardized pancreatic extract prepared in the chemical laboratory of this section showed a marked increase since 1942, due to heavy demands for anti-cholera vaccine from this Province and from other Provinces also. The bio-chemical examination of blood, urine, cerebrospinal fluid and the preparation of standardized chemical reagents for use in other departments of this Institute, were also carried out.

The investigation on the rate and quantity of lime bleaching out of the Mettur Dam, through seepage and leakage was continued and composite samples of the leakage waters collected at different lake levels were analysed.

At the request of the Sanitary Engineer to Government, Madras, the percentage by volume of settleable solids was determined in samples of sewage collected from the main outfall drain at Ookadam, in connexion with the proposed drainage scheme for the Coimbatore Municipality.

The problem of treatment and disposal of offensive wastes from rice mills was investigated. These wastes were in a highly putrescible state emitting a foul odour, and were not fit to be let into town drains or water courses. Samples of the waste water from a mill in Nidadavole examined in 1942 showed also high acidity and a large amount of organic matter. The addition of paddy husk charcoal to these wastes was found to be effective as a deoderant and after a discussion of the subject, the Committee on Water and Sewage Purification decided to recommend this method of abating the nuisance for field trial in the West Godavari district.

Samples of sand from Golden Rock, Trichinopoly, were analysed for their uniformity coefficient, organic matter, clay and loam to see whether they were suitable for use in mechanical filters.

Municipal and panchayat board water-supplies.—Table No. VIII gives the number of protected water-supplies examined at the Institute with details regarding source, method of filtration, chlorination, etc.

The usual section of the annual report dealing with the condition of the water-supplies in individual municipalities, jails and railway stations has been omitted this year also in view of the necessity for economy in the use of paper. A statement giving details regarding the condition of the individual supplies during the period under report, the defects noticed and corrections needed, is being sent to Government separately. In every case, which called for special attention, the requisite advice has been directly communicated to the authorities concerned.

The municipalities having mechanical filters experienced difficulty during the war years in obtaining regular supplies of alum, and consequently at some places, the filtered water was discoloured and hazy. The supplies drawn from infiltration galleries were generally satisfactory. Of the sand filters, those at Adoni, Madras, Ramachandrapuram and Vellore were not functioning quite satisfactorily.

Chlorination of water-supplies.—Of 66 municipal and panchayat board water-supplies in the Province, 43 supplies are filtered and chlorinated, and in 3, chlorination is the only safeguard against water-borne diseases. Twenty of these supplies are not chlorinated.

From the results of periodical analysis of the drinking waters to these municipalities and panchayat boards, during these five years, it is seen that this essential procedure of water purification is not carried out effectively in

many cases. This is in part due to the fact that in some municipalities, the water-works are situated far away from the town for efficient check to be exercised by the concerned authorities, and also to the fact that at a majority of the water-works, bleaching powder solution is used and its addition manually controlled. Bleaching powder deteriorates rapidly on storage, and it is difficult to regulate the treatment properly, as the feed pipe becomes frequently choked with sludge. The mixing equipment is defective in many cases. Any system of chlorination to be effective, must be capable of automatic adjustment and regulation to ensure uniform and adequate treatment of the water. Liquid chlorine is the sterilizing agent of choice for this purpose, and this is now manufactured in the Province on a commercial scale. It is therefore advisable that all water-works should install automatic apparatus using liquid chlorine for properly chlorinating the water. The Water and Sewage Purification Committee discussed a note on this subject presented to it by the Director, King Institute, at a meeting held on the 24th July 1945 and accepted the principle of introducing automatic chlorinators for all public water-supplies in the Province.

Jail water-supplies.—Of the 21 water-supplies to jails including Borstal and Certified schools which were under examination during the period under report, those at Bellary, Coimbatore, Chingleput, Madura, Nellore, Vellore, Trichinopoly and Vizagapatam, were drawn from the respective municipal mains. Chlorination was efficiently carried out in some of the jails and was defective in others.

From a general review of the results obtained on samples collected from the jail supplies, it was felt that chlorination procedures in vogue should be under more effective control. In certain cases, there was definite evidence of overdosing, while in some, the dose applied was not properly regulated. It was therefore considered that sampling jail supplies without prior notice, as is now done in the case of municipal and other supplies would assist in checking and improving the control of chlorination in these institutions. The Inspector-General of Prisons kindly agreed to this procedure and the results obtained have amply justified the change.

Railway water-supplies.—When the periodical examination of the protected water-supplies in the Province was started in 1918, a short list of important railway stations was also included in the list of supplies for examination. Twenty-nine more stations were later added to this by the Fairs and Festival Committee of the Government of Madras, in view of pilgrim traffic and as centres of business and also of fairs and festivals. The enlarged list was approved by Government in their Order No. 661, P.H., dated 6th April 1927. At present, the supplies of 49 railway stations—19 on the South Indian Railway, 26 on the Madras and Southern Mahratta Railway and 4 on the Bengal-Nagpur Railway—are examined three times a year.

Considering the importance of railway water-supplies in its relation to public health, it is necessary to exercise greater control over the quality of water supplied to the travelling public on railway platforms and in refreshment rooms, in the same manner as in the case of local bodies. It is also necessary to bring the drinking water-supplies of some more important stations under analytical control, as at present it must be considered that only the fringe of this important public health problem has been approached. Some more important stations to be included in the list of supplies periodically examined at this Institute have been selected and the matter is now under the consideration of the Committee on Water and Sewage Purification.

Water and Sewage Purification Committee.—The personnel of the Committee consisted of the Director of Public Health, the Sanitary Engineer to Government and the Director of the King Institute, Guindy, with the Senior Public Health Assistant, King Institute, as its Secretary. Rao Sahib T. N. S. Raghavachari, retired senior Public Health Assistant, was appointed a non-official member of the Committee as per G.O. No. 2757, P.H., dated 3rd November 1943.

At a meeting held on 2nd August 1944, on the eve of the retirement of Rao Bahadur Dr. R. Adiseshan, the then Director of Public Health, Madras, the Committee placed on record its appreciation of the valuable services rendered by him as the President of the Committee.

There were 16 meetings of the Committee between September 1941 and March 1946, when problems relating to water-supplies and sewage were discussed. Among these were—

(1) The improvements to the Coimbatore water-supply.

(2) The alleged pollution of irrigation wells by tannery wastes near Dindigul.

(3) The problem of disposal of factory wastes from (*a*) the Canara Paper Mills at Rajahmundry, (*b*) a distillery at Vizagapatam and (*c*) of the sewage from the Mambalam area in the Madras City.

(4) The variation in the chemical quality of the Virudhunagar water-supply.

(5) Growth of iron bacteria in the infiltration gallery at Negapatam.

(6) Algal control of Mahamakham tank, Kumbakonam.

(7) The protected water-supply scheme for Guntakal Panchayat with special reference to presence of fluorides in the proposed source and construction of a fluoride removal plant at Government expense.

(8) Efficient chlorination of water-supplies—existing drawbacks in hand controlled methods using bleaching powder solution and the need for the installation of automatic chlorinating apparatus using liquid chlorine.

(9) Improvements to the Ootacamund water-supply.

A scheme proposed by the Director, King Institute, for the constitution of a "Water-supplies Inspectorate" was discussed by the Committee at its meetings held on 11th November 1945, 5th February 1946 and 13th February 1946 and was approved. The scheme was drawn up with a view to ensure efficient control of the functioning of the water purification and treatment plants in the Province, since under present conditions, sufficient facilities do not exist to carry out effectively and expeditiously the recommendations made for correction of the defects and modification of the plants. The defects now noticed in many of the water-supplies in the Province were reviewed in detail and these were found in most cases to involve considerable danger to public health and to need immediate attention. The Inspectorate consisting of an Engineer and a Water Analyst would form the expert technical central agency for carrying out the needed improvements with the co-operation of the local engineering and public health staff. It was also the opinion of the Committee that in view of the deplorably low standard of knowledge of the personnel now employed in water-works by municipalities and other local bodies, it was essential to train these operators in modern methods of water-works practice. It was therefore decided that it shall be one of the duties of the Inspectorate to initiate and give this special training. This would help in the efficient maintenance and operation of municipal water-works.

The proposals have been forwarded to Government and their sanction is awaited.

The Committee also reviewed periodically the progress of the experiments carried out at the Filter Research Station, Kilpauk. Brief details of the important experiments have been given under "Research."

Medical Zoology.—Two strains of *P. gallinaceum* (Brumpt 1935), one from a domestic fowl obtained from Ceylon through the courtesy of Dr. Crawford and the other isolated from a South Indian jungle fowl (*Gallus Sonnerratti*) were maintained by serial passage in chicks. The virulence of the parasites showed no diminution after more than two hundred serial passages. Strains of bird and monkey malaria were supplied on request to research workers in Coonoor and Calcutta.

Specimens of mosquitoes, fleas, sandflies, flies and other insects received were identified and reported upon. A number of snakes sent by the military authorities were also identified.

In connexion with an inquiry at the Indian Institute of Science, Bangalore, on the efficacy of certain drugs in the treatment of filarial infections, request for the supply of a large number of filaria-infected garden lizards (*Calotes versicolor*) for experimental purposes was received and complied with. Twelve filaria-infected garden lizards were also sent to Dr. Gordon of the Liverpool School of Tropical Medicine by air on 30th August 1945. Dr. Gordon wrote back to say that the lizards arrived Liverpool alive and in good condition and that they were feeding well after recovering from the effects of the long air and rail journey.

Specimens of a swarming species of caterpillar from the compound of the Municipal High School, Mayavaram, were identified. These specimens were densely clothed with hairs, which, when detached were blown about and caused intense skin irritation to the school boys. Measures for overcoming the nuisance were suggested to the Municipal Health Officer.

Field investigations.—Field investigations on problems connected with the operation and maintenance of water purification plants, surveys of water quality and resources for new water-supplies, treatment and disposal of sewage and factory wastes and the control of algal and other biological growths in water-supplies, were carried out as and when necessary, by the officers of the section and in all instances, detailed reports on the results were furnished to the concerned authorities. The nature and scope of some of these investigations which are of special interest are mentioned briefly below:—

A. *Water purification.*

(1) *Coimbatore water-supply improvements.*—An investigation into the factors causing turbidity and discolouration of the Coimbatore water-supply and the method of improving the physical features of the water was carried out in 1943. A detailed programme of work on the problem was drawn up after an inspection by the Water and Sewage Purification Committee of the Siruvani lake, the channel leading to the tunnel, the tunnel exit and the diversion weir. Experiments and analysis of the water were carried out at the field laboratory specially set up for the purpose during all the months (from March to August) covering the dry and the monsoon seasons. The results of these analysis and surveys indicated that a major part of the turbidity was derived from the Anayar river, that the Pattiar river also contributed to the turbidity of the water during the flood period and that the Siruvani lake water was fairly clear even during the monsoon season. It was also revealed that the supply to the town was derived exclusively from the Pattiar river, since deposition of silt at the river mouth had raised the bed and diverted the stream water into the tunnel instead of into the Siruvani reservoir. It was recommended in the final report on these investigations that the construction of a pipe aqueduct across the Pattiar would ensure the supply of settled clear water of the Siruvani lake and that the water should be piped from the tunnel outlet to the existing settling tanks to avoid the influence of the Anayar river.

(2) *Saidapet water-supply—Variations in the chemical quality of the water.*—The chemical features of the Saidapet water-supply drawn from an infiltration gallery showed wide variations from time to time. Detailed analysis of samples collected every hour from different points along the gallery and the suction well showed that the quality of the water varied in different reaches of the gallery itself and also that saline springs in the suction well itself further influence the quality of the water. The relation between the extent of variation in the quality of the water and the pumping rate and period was also studied.

(3) *Overhauling of filters at Chidambaram.*—The causes for the considerable drop in efficiency of the pressure filters at Chidambaram were investigated by the Senior Public Health Assistant in 1943 and it was discovered that this was a result of inadequate depth of filter sand, which was in addition, dirty and ungraded. The filters were overhauled with the technical advice and assistance of this section. Apparatus for alum dosing the water and for chlorinating the filtered water specially designed to suit the plant, were made at the Experimental Filter Station, Kilpauk, and supplied to the municipality.

(4) *Guntakal water-supply—Investigations on new schemes.*—In an attempt to tap a source free from fluorides for supplying water to the Guntakal Panchayat, samples were examined from a large number of wells, trial bores, tanks, etc., and after a discussion of the results at the meetings of the Committee on Water and Sewage Purification, it was decided to investigate in detail the monthly variations in the fluoride content of the waters of two tanks in the Thimmapuram area. These studies showed that it would be necessary to adopt some method for the removal of fluorides from these waters. Proposals have already been drawn up for the installation of a pilot plant to conduct experiments on fluoride removal.

(5) *Virudhunagar water-supply—Variations in chemical features.*—The total dissolved mineral content, chlorides and hardness of the water derived from the infiltration gallery in the bed of the Arjuna river at Virudhunagar were observed to vary at successive examinations. This peculiar feature was discussed at a meeting of the Water and Sewage Purification Committee in November 1943 and it was decided to investigate into the causes for the variation noticed. A survey of the area and the nature of the river bed upstream was carried out in September and October 1944 and samples of water from the river, the gallery and certain wells on both the banks were periodically analysed, both when the river ran low and when it was in floods. The results of the investigations revealed that the variations in the chemical constituents of the gallery water were very similar to those observed in the river water also, by which the gallery appeared to be influenced. The quality of the river water appeared to vary as a result of concentration and stagnation during periods of low flow.

(6) *Tungabhadra Project—Water-supply investigation.*—A survey was made of the water shed and water quality of the proposed water-supply to the Tungabhadra Project area. The supply was intended to be derived either from the Tungabhadra river or from one of two channels in the area. The channels were free from sewage pollution, but received drainage from cultivated fields on the banks. Chemical examinations were carried out on representative samples collected from the different sources. These showed that the waters were alkaline in reaction, and that their clarity was improved considerably on the addition of 1½–2½ grains of alum per gallon. It was recommended that, for these waters purification by filtration through mechanical gravity filters, with proper arrangements for alum coagulation and settlement may prove more efficient than slow sand filtration after plain settlement.

B. Sterilization of new mains.

The water mains of the newly commissioned protected water-supply to the Bodinayakkanur Municipality were sterilized in March 1944. Water entering the gravity main from the off-take in the Kottagudi river was treated with 30 parts per million of chlorine and allowed to contact period of 12 hours, after which it was thoroughly flushed out with raw river water. The bacteriological quality of samples of the water were examined at the field laboratory both before and after sterilization, and it was found that after sterilization of the main, the water did not deteriorate in quality during transit. The entire distribution system was also similarly sterilized, the treatment controlled by frequent bacteriological analysis of samples of filtered water collected from the headworks and from the distribution taps. Sterilization was effective and the quality of the water at the distal ends of the distribution system resembled that of the water put into the main at the headworks.

C. Investigations on sewage and trade waste disposal.

(a) *Tannery wastes.*—It was alleged that certain irrigation wells in Seelapadi village near Dindigul were contaminated and rendered unsuitable for irrigation by the discharge of tannery wastes into a stream in the locality. A study of the problem was undertaken in September 1943 at the request of the Director of Public Health, Madras and the Sub-Collector, Dindigul. A detailed sanitary and soil survey of the area was carried out, and a large number of samples from

wells situated on both sides of the stream, above and below the point of the main discharge of tannery wastes were analysed. The investigation reveals that generally, the waters of the wells on the eastern side of the stream were of fair quality and were influenced by a neighbouring tank. The tannery wastes did not appear to contaminate the well waters, the chemical features of which were more due to the nature of the sub-soil and strata.

(b) *Waste from paper mills.*—The study of the composition of the waste waters of the Andhra Paper Mills at Rajahmundry and its suitability for discharge into the Godavari river was concluded in 1943. The Water and Sewage Purification Committee inspected the area and it was concluded that in view of the high degree of dilution of the waste water with the water flowing in the river, the pollution of the river water was within the permissible limits.

(c) *Wastes from distilleries.*—The question of disposal of the distillery wastes from the Vizagapatam Commercial Corporation was referred to the Institute for advice by the Municipal Health Officer, Vizagapatam. Samples of the waste were analysed at the Institute. A series of laboratory experiments were carried out to evolve a suitable method for treating the effluent to render it innocuous as regards odour, etc. Treatment with lime, alum and ferric chloride each separately and in combination did not give satisfactory results in reasonable dosages. Activated carbon was also tried with little success. The Committee on Water and Sewage Purification discussed this problem at one of its meetings and decided to advise the Corporation to adopt any one of the following three methods which is found feasible and economical:—

(1) Treatment on land, (2) disposal by dilution, and (3) evaporation and conversion into cattle fodder.

(d) *Wastes from sugar mills.*—An investigation was carried out in March 1946 at the request of the Secretary, Revenue Board, on the extent of pollution of the Pugalur channel by the waste waters discharged into it from the Deccan and Abkari Sugar Factory, Pugalur, Karur taluk, under the management of Messrs. Parry & Co., Madras. The channel serves mainly for irrigation, but is also extensively used for drinking and other domestic purposes by the villagers in the neighbourhood. It was alleged that the channel water was rendered unfit for irrigation and drinking purposes as a result of pollution by the untreated factory waste. The total volume of waste from the factory was 10,000 gallons per day. It was discoloured and contained fair amounts of putrescible organic matter.

Experiments were conducted in the field using a pilot plant, to assess the working of a new type of condenser. It was observed that the condenser discharge resembled the feed water in its chemical features but contained a greater amount of saline ammonia and had a sweetish smell. If the effluent from the large scale plant would resemble this, it would not materially affect the quality of the channel water when discharged into it. Other organic wastes are disposed off after settlement, by irrigating cane fields owned by the company and this procedure was found to be satisfactory in preventing channel pollution.

D. Algal control.

A brief account of the more interesting problems investigated during the period under report is given below:—

1. *Occurrence of iron bacteria in the Negapatam water-supply.*—The presence of masses of organic growths in the water derived from the infiltration gallery laid on the Vettar river-bed, was first noticed in September 1941. Dark coloured clumps of the organisms were also found in the overhead service reservoir at Negapatam and in the water drawn from the distribution taps, which caused complaints from the consumers. These masses were composed of iron depositing thread bacteria belonging to the Genera *Leptothrix* and *Crenothrix*. Investigations into the origin and distribution of these growths were carried out and it was discovered that they grew attached to the inside surface of the collecting well. These masses became easily dislodged and were carried into the suction well from where they were transported to the service reservoir

during pumping. Subsequent investigations clearly demonstrated that these organisms thrived in the interior of the gallery itself. A study of the nature and biology of the organisms revealed a more or less close positive correlation between the amount of dissolved organic matter and oxygen in the gallery water and the development of the bacteria.

Treatment at the suction well with heavy doses of chlorine destroyed the growths and retarded their subsequent development. It was recommended that the interior of the gallery should be systematically treated with chlorine or chloramine for completely eradicating the nuisance. Plans have been already prepared for conducting the treatment when the water level in the river would permit its execution.

The occurrence of iron bacteria in a gallery supply is the first record of its kind in India. Similar growths have since been observed in the storage reservoir at Coonoor.

2. *Algal growths in the Ootacamund water-supply.*—An investigation into the causes operating for the deterioration in the bacteriological and aesthetic quality of the water-supply to the Ootacamund Municipality was carried out in November 1945. The water sheds of the Tiger Hill, Dodabetta, Marlimund and Kodappamund reservoirs were surveyed and it was observed that the deterioration in water quality had resulted from either or both of the following causes:—

(*a*) Extensive deforestation of the catchment and cultivation operations thereon resulting in soil washings entering the reservoirs after rains.

(*b*) The presence of a large number of labourers connected with the above operations in the catchment area.

Studies of the algal flora of these waters showed that the Dodabetta group of reservoirs supported a heavy growth of algae and contained large amounts of organic matter. The waters were discoloured and opaque. The intense growth of organisms had probably followed removal of ground cover over the catchment area and unusual decrease in water level. Application of copper sulphate at the inlet to these reservoirs was recommended as a control measure.

Deterioration in the bacterial quality of this supply pointed to the need for chlorination. This aspect of the problem was also investigated and recommendations were made for installing chlorinating apparatus for each of the five separate distribution systems which could be brought promptly into commission whenever required. Proposals have also been made for filtering and chlorinating the supply from the Marlimund reservoir, which is ordinarily more liable for contamination.

3. *Algal control in temple tanks.*—(*a*) The waters of many tanks in South India, are normally so heavily algae-laden that the water is coloured deep green. The commonly predominant organisms are species of blue green algae belonging to the genera *Synecococus*, *Microcystis*, *Oscillatoria*, *Anabaena* *Phormidium*, and rather rarely members of the green algae, *Volvocales* and *Chlorococcales*. These often constitute what may be described as permanent "water blooms." Studies on the biological characteristics of these organisms occurring in tanks at Kumbakonam and at Saidapet were carried out for the purpose of evolving a cheap and sufficiently effective measure for destroying the algal growths. It was found that the application of freshly slaked lime to the water sufficient to utilize completely the bi-carbonate alkalinity of the water, and subsequent sprinkling of a sufficient quantity of finely powdered charcoal over the water surface to form a black layer killed the organisms in 2 to 4 days. The method deprived the actively growing organisms of both the essential carbon dioxide and sunlight. The method was tried out in a small tank at Saidapet and in a temple tank at Tirupati with encouraging results.

(*b*) *Mahamakham Tank, Kumbakonam.*—A study of the plankton of the Mahamakham Tank at Kumbakonam was carried out between March 1944 and February 1945 at the request of the Director of Public Health, Madras, to determine suitable measures for eradicating the organisms causing discolouration of the water and foul smell in order to keep the tank water aesthetically satisfactory at the time of the Mahamakham festival. Periodical visits were made

for conducting the field investigations and a large number of samples of the water and the tank sediment were examined microscopically and chemically. The plankton was composed of very heavy growths of *Microcystis*, *Euglena* and *Diatoms*. The bottom sediment was composed of a thick upper layer of flocculent organic ooze below which was found a thinner layer of black sand. Based on these studies, it was recommended that the tank should be emptied of the heavily algae-laden water and the silt removed. These measures were carried out and the fresh water that later accumulated in the tank was treated with copper sulphate and bleaching powder before the day of the festival in February 1945.

4. *Control of biological growths in industrial waters.*—The Madras Electric Supply Corporation requested assistance in a study of the organic growths flourishing in the condenser cooling water at their main power station, Basin Bridge. These growths choked the condenser tubes and impaired heat transference.

The warm water issuing from the condenser is let into a rectangular cooling pond and after traversing the length of the pond it is picked up by pumps and sent into the cooling towers. The cooled water returns to the condenser along a masonry channel (then covered for A.R.P. purposes) and an underground conduit. A survey of the water course revealed the occurrence of abundant growths of the brackish water Bryozoan (Moss Animalculae) *Plumatella sp.* attached to the sides of the masonry channel and in the conduit leading to the power house. These organisms prefer a medium rich in organic matter and thrive in dark sheltered regions on a diet of minute plant forms chiefly diatoms, a species of which (Chaetoceros) occurred in great abundance as the plankton in the channel water. The addition of 1·0 part per million of copper sulphate to the water at the beginning of the covered channel was recommended as a measure to render the water unsuitable for the development of *Plumatella*. This was put into practice and it has yielded very good results.

5. *Deterioration of timber in the cooling towers at the power house of the Madras Electric Supply Corporation, Basin Bridge.*—The problem of the deterioration and collapse of the wooden gallery inside the natural draft cooling tower of the Madras Electric Supply Corporation was referred to this Institute for investigation by the same Corporation. This wooden structure is always wetted by brackish water which splashes downwards inside the gallery. A detailed field study was carried out of the condition of the perished wood and the organic growths on it. These studies indicated that the structure may have been weakened owing to the intense oxidation of the cellulose and lignin in the wood by the nascent oxygen liberated by the algae during photosynthesis. Another contributory cause was the burrowing activity of numerous insect larvae which occurred sheltered under the thick algal mat. Dosing the water before entry at the top of the cooling tower with a copper-chlorine-ammonia solution was recommended for preserving such wooden structures from attack.

9. Reports of Investigation Units.

1. *Investigation of an outbreak of epidemic hepatitis in Ootacamund, July 1942, by Dr. M. K. K. Menon.*—During April and May 1942, a number of cases of epidemic jaundice had occurred in Ootacamund, and there was in addition a sharp outbreak in the European Girls' Boarding School there. Investigation of this outbreak was done at the request of the District Medical Officer, Ootacamund and the Director of Public Health, Madras.

The main outbreak was confined to the Boarding School, viz., Tudor Hall, comprising 22 cases. The disease was of a mild nature. The onset was sudden with high temperature varying from 102° to 104°, rigors, severe headache, and pain over chest and shoulders. Vomiting and acute abdominal pain simulating appendicitis were noted in one case. Fever which lasted from 2 to 5 days came down by lysis. Jaundice appeared between the 5th and 7th day of disease. The liver was enlarged in almost all the cases three to four fingers breadth below the costal margin. In urine, bile salts and bile pigments

were present but not albumin. The average duration of jaundice was 10 to 12 days. The recovery was uneventful, except in one case which developed a severe degree of flaccid paralysis of lower extremities with anæsthesia.

The outbreak was an explosive one, 22 of the 36 inmates being affected within a period of one month. The crop of cases occurring in June could be traced to the first two cases which had occurred towards the end of April. The incubation period was thus 4 to 5 weeks approximately. The water-supply to the boarding house was mainly from a well, the condition of which at the time was not satisfactory. The well was liable to contamination from clogged or overflowing drains from the bath rooms, etc. The possibility of the epidemic being a water-borne one had suggested itself.

Laboratory investigations were planned either to establish or exclude the diagnosis of such diseases as malaria, salmonella infections, leptospirosis and tropical typhus or its varieties. The facilities at the Pasteur Institute, Coonoor, were availed of for the purpose. All the tests were negative. Ultimately the diagnosis of infective hepatitis was arrived at.

2. *Investigation of an outbreak of acute gastro-enteritis in Vizagapatam town (1944) by Dr. K. Kalyanaraman.*—In 1944, from the beginning of the year, sporadic cases of gastro-enteritis were being reported in Vizagapatam town. In July, the disease assumed epidemic proportions. At the request of the Director of Public Health, Madras, the unit was sent to the area in August 1944 to investigate the nature of the outbreak. There were 325 attacks and 129 deaths during the epidemic. Clinically the outbreak appeared to be cholera. This was confirmed bacteriologically. *V. choleræ* were isolated from 41 cases out of 63 examined.

3. *Investigation of an outbreak of gastro-enteritis in a labour camp at Ayyempet, Conjeeveram, by Dr. Sumitra Rao.*—The camp had housed nearly 1,000 labourers and was composed of several units. The distribution of disease in these units was more or less uniform. Seventy-five cases with 19 deaths had been reported during the period of about two months. Some proved to be cases of dysentery (*B. flexner*). From the majority of cases, no pathogenic organisms were isolated. Aetiologically the outbreak was a mixed one.

4. *Investigation units in connexion with fairs and festivals.*—At the request of the Director of Public Health, Madras, these units were detailed for work in connexion with the Godavari Pushkaram festival at Rajahmundry in June 1944, the Mahamakham festival at Kumbakonam in March 1945, and the Krishna Pushkaram festival at Bezwada in July 1945. The object of the units was to secure very early diagnosis of any epidemic disease that would be occurring during the festival. The units were equipped to conduct laboratory examinations in the field.

During the Godavari Pushkaram and Mahamakham festivals no untoward incidence of any infectious disease was noted. During the Krishna Pushkaram festival, however, a few cases of gastro-enteritis were reported. Out of 53 specimens examined, *V. choleræ* was isolated from 12. Early detection of those cases helped the authorities to take suitable preventive measures in time and widespread epidemic of cholera did not result from this initial focus.

5. *Investigation of an outbreak of cerebro-spinal meningitis in Coimbatore Jail—January to February* 1945—*by Dr. Francis Xavier.*—During January and February 1945, there were 14 cases of cerebro-spinal meningitis with 3 deaths in the Central Jail, Coimbatore. By the time the unit arrived for the investigation, the epidemic was already on the decline, but with the cases available for study, the diagnosis of cerebro-spinal meningitis was confirmed by bacteriological examinations.

It was interesting to record that the majority of cases had occurred in one ward of the jail. The history of the epidemic was carefully investigated. It would appear that the first case was in an inmate who had suffered from the

disease two months previously. The nature of the infection was diagnosed at the time as cerebral malaria, but the symptoms recorded were not different from those of cerebro-spinal meningitis. He was subsequently transferred on recovery to the ward where the maximum number of cases had subsequently been reported. It seems probable therefore that the source of infection would be traced to this first case. Suitable preventive measures were recommended to the authorities to control the infection.

6. *Investigation of an outbreak of suspected meningitis in the Police Recruiting School, Vellore—February* 1945—*by Dr. Francis Xavier.*—From December 1944 to the middle of February 1945, about 50 cases of pyrexia were reported to have occurred in the Police Training School, Vellore. There were only four deaths. Two deaths were diagnosed as due to cerebral malaria and two were diagnosed as due to meningitis. At the time of the unit's visit, a few cases were available for study. Bacteriological examinations of some of these cases revealed infection with *N. catarrhalis*. It was concluded that the epidemic was a mixed one and was not due to meningococcus infection.

7. *An outbreak of suspected cerebro-spinal meningitis in the Central Jail, Cannanore—April* 1945—*by Dr. (Miss) T. R. Ethirajamma.*—After the occurrence of the first case in the jail in April 1945, which was diagnosed bacteriologically as due to meningococcus infection, the services of the Investigation Unit were called for to investigate few other cases bacteriologically and to suggest prophylactic measures to arrest the epidemic. Only two cases were available for study. One proved to be due to meningococcal infection, and the same organism was isolated from an immediate contact. The diagnosis of meningococcal infection was thus established. Suitable preventive measures were recommended including the treatment of contacts with M. & B. 693. Further cases were not reported after this procedure.

8. *Investigation into the abnormal incidence of enteric infections in Coonoor Municipality*—1945—*by Dr. Russell.*—Enteric fever incidence has been high for some years in Coonoor Municipality. In 1943, 70 cases of typhoid were recorded and 75 in 1944. Highest incidence was always noted during the summer months. In 1945, when abnormal increase was noted during April and May, the Director of Public Health, Madras, requested the Institute to initiate this investigation.

The unit commenced its investigation in the middle of June when already 40 cases had occurred since the beginning of the year. After the arrival of the unit, the number of cases reported declined considerably and very few fresh cases were available for study. However the nature of the infection was established by bacteriological and serological tests.

Epidemiologically the epidemic showed some interesting features. Of the total of 51 cases reported from the beginning of the year to July, 10 had occurred in April, 17 in May and 12 in June. While cases had been reported from all the 12 wards comprising the municipality, highest incidence was recorded in Ward I which had contributed 19 cases. Incidence according to communities was 21 in Hindus, 26 amongst Christians, and 4 in Muslims. Highest incidence was recorded in age group below 12 years, nearly 30 cases. The distinction in other groups was uniform.

It is interesting to speculate whether the abnormal incidence in children was only apparent because the adult population had been immunized by previous attacks of the disease. The sanitary conditions of the area would lend support to this view.

Detailed investigation showed that neither the water-supply, milk or any other article of food could be incriminated in the spread of the infection. Fly nuisance was considerable especially during summer. It was however noted that the trenching ground was not the source of fly-breeding.

The preliminary investigations conducted by the unit have only emphasized the need for further study of this important public health problem.

PART II.—RESEARCHES.

Chick Membrane Vaccine Lymph: Field experiments to assess its value as immunising agent against Smallpox compared with Calf Lymph.

Financed by the Indian Research Fund Association by Dr. C. G. Pandit, Dr. G. N. V. Krishnan and Dr. K. S. Balasubramaniam.

Genesis of the experiment and organization.—At the suggestion of the Ministry of Health in England and the Public Health Commissioner with the Government of India, a field experiment was undertaken in 1940 to test the relative value of chick membrane vaccine lymph and calf lymph as immunizing agents against smallpox. The general programme of work was drawn up in consultation with the Director of Public Health, Madras, and the Ministry of Health authorities in England.

The choice of a suitable place with sufficient unprotected population for the experiment within easy reach from the King Institute, Guindy, Madras, was difficult because of intensive vaccinations done in the previous years due to an extensive epidemic of smallpox in the province. However, 26 villages with a total population of about 66,000 were selected for this study. They are situated on the main lines of communication and within 15 miles radius from the King Institute, Guindy, Madras.

Chick membrane vaccine lymph and calf lymph prepared at the King Institute were transported in ice in a thermos-flask to the place of vaccination and handed over to the vaccinator. The two types of lymph were kept in ice and used without undue exposure to higher temperatures. Alternate persons were vaccinated with chick lymph and calf lymph without any selection being made for either group. Detailed records of age, sex, date of vaccination, type and batch number of the lymph used, etc., together with the results of verification one week after vaccination were maintained. When in the presence of an epidemic of smallpox, revaccination has to be done, the same type of lymph was used for revaccination as was used for primary vaccination.

Manufacture.—A strain of membrane lymph was initiated by adapting a dermal strain of calf lymph to the chorio-allantoic membrane of the developing chick. The technique employed was generally that described by Sanjiva Rao, Pandit and Shortt (Ind. Jour. Med. Res., 1936, v. 23, pp. 857–864). From the commencement of the experiment till December 1942 the lymph was issued in a dilution of 1 in 10 in tyrode; from December 1942 to June 1943 in a dilution of 1 in 10 in 50 per cent glycerine-tyrode and from June 1943 onwards in dilution of 1 in 5 in 50 per cent glycerine-tyrode.

Storage.—The lymph was stored at a temperature of –5°C. and the potency periodically tested. The different batches of membrane lymph showed great variations in their keeping qualities. Some batches of the lymph lost the potency within a month while others retained their potency for at least three months. This necessitated testing of lymph prior to issue for field investigations. Testing of the potency of lymph returned from the field also served as a check on the potency of the lymph at the time it was used.

Day to day reactions.—Detailed observations were made on the development of vaccinal reaction with both chick membrane and calf lymphs.

Velachery, a village situated close to the King Institute, was chosen for this study. Primary vaccinations were done in 56 children, 28 with chick membrane lymph and 28 with calf lymph. The children were inspected daily from the third to the ninth day. Records of local reaction (size and the nature of the vesicle and the extent of the surrounding areola) and the general reactions as rise in temperature and other changes were noted. The results indicate that the reactions due to vaccination with chick membrane lymph are milder and develop more slowly than those with calf lymph, development at all stages being retarded by 24 to 48 hours. But after the full development of the pustule no differences were noticed between the reactions due to the two types of lymph and the subsequent course of vaccination in both was indistinguishable.

Results in primary vaccination.—The average case success rate with chick membrane lypmh varied from 76·7 per cent to 90·9 per cent and the insertion success rate from 49·6 per cent and 73·2 per cent. The case success and insertion success rates with calf lymph were more or less uniform and were about 99 per cent and 95 per cent, respectively. This experience is analogous to that recorded in England where with chick membrane lymph a case success rate of 80·6 per cent was obtained.

Results of revaccination.—Case and insertion success rates in revaccination with chick membrane lymph varied from 11·8 per cent to 21·7 per cent and 7·8 per cent to 14·8 per cent, respectively. The corresponding figures for calf lymph were 36·5 per cent to 57·5 per cent and 26·7 per cent to 43·5 per cent, respectively. It is interesting to note that in the year 1943–44 there was a rise in the success rate in revaccinations with chick membrane lymph though there was a slight fall in the success rate in primary vaccinations.

Duration of immunity as tested by revaccination with the homologous type of lymph.—These observations were made in order to ascertain differences, if any, in the antigenicity of the two lymphs. For this purpose all the children primarily vaccinated at the commencement of the experiment were chosen. Three hundred and fifty children in each of the two groups were available for study. The results of subsequent revaccination were also compared with the number of scars noted after primary vaccination. The revaccinations were inspected at 24, 72 and 120 hours. The following results were obtained:—

The percentages of frank takes were higher with calf lymph than with membrane lymph, viz., 20·9 per cent and 3·4 per cent, respectively. The ratios were reversed in cases showing total failure, viz., 3·5 per cent in calf lymph and 32·3 per cent in membrane lymph. As regards immune reactions the percentage was higher with membrane lymph than with calf lymph. These results would seem to indicate that membrane lymph is in a sense a "weaker" lymph than calf lymph as regards antigenicity. It is interesting to note also that 20 per cent of children vaccinated in infancy with calf lymph lose their protection within a period of four years when tested with revaccination with calf lymph.

The number of scars after primary vaccination and their influence on results after subsequent revaccination were also studied in order to determine the relation between the number of scars and the duration of immunity.

In children in both the groups showing four scars after primary vaccination the percentage of takes with both the types of lymph was of the same order as noted above, viz., 1·4 per cent frank takes with membrane lymph and 21·6 per cent frank takes with calf lymph. Taking the membrane lymph group alone the results of revaccination in children with varying number of scars after primary vaccination were very striking, viz., 1·4 per cent frank takes in children with four scars and 11·5 per cent in children with one or two scars only.

The view that the number of scars has some relation to the duration of immunity to vaccine receives therefore some support.

Cross-immunity experiments.—Sixty-six children in each of the two groups were chosen for the study. These were revaccinated with heterologous type of lymph that is, after primary vaccination with calf lymph revaccination was done with membrane lymph and vice versa. The results obtained are again of the same order as noted above. In the group with primary vaccination with calf lymph and revaccination with membrane lymph the percentages of immune reactions and frank takes were 98·5 per cent and 1·5 per cent, respectively, while in the reverse group they were 40·9 per cent and 57·6 per cent, respectively, the rest being failures. The absence of Duran Reynolds factor in membrane lymph as opposed to its presence in calf lymph might perhaps explain these differences in the behaviour of the two types of lymph.

Protection against smallpox afforded by the two types of lymph.—In the first two years of observation no epidemic of smallpox had occurred in the area. In the third and fourth years, however, only a few small sporadic outbreaks were noted in a few villages, and no cases were recorded in the cases recently vaccinated with the two types of lymph.

In 1945, however, there was a widespread infection in the area and a very severe epidemic of smallpox occurred in one of the experimental villages showing 64 attacks and 13 deaths. This village was chosen for intensive study. A house to house survey was done noting the vaccinal state of population including the number of marks and the incidence of smallpox in the community. The total population at risk was 1,442 with, as stated above, 64 attacks and 13 deaths.

Certain broad conclusions are given here—

(1) In a group of 96 children primarily vaccinated with chick membrane lymph during the last five years there was no attack of smallpox.

(2) In a similar group of 118 children vaccinated with calf lymph there was one attack and no death. This case was in an adult of 25 years of age and was vaccinated 5 months previously.

(3) In the unvaccinated group of 169 (all age groups) there were 19 attacks and seven deaths.

(4) The remaining cases had occurred in the population previously vaccinated with the calf lymph before the commencement of the membrane lymph experiment. These data will be presented at a later date.

(5) The 64 cases of smallpox had occurred in 36 houses in the area. The inmates numbered 203. This group can be considered as having been exposed to maximum intensity of infection. The analysis yielded results of interest from the point of view of vaccination in general. The relevant data from the point of view of membrane lymph show that—

(i) in eight cases of primary vaccination with membrane lymph there were no attacks;

(ii) in ten cases of primary vaccination with calf lymph there was one attack. This, as stated before, was an adult of 25 years of age vaccinated five months previously; and

(iii) in the unvaccinated group of 30 (all ages) there were 19 attacks and seven deaths. In the age group of 0–5 years there were eight unvaccinated children of whom seven got the attack and three died.

It would appear from these data that within the period of observation of five years no difference was noticeable in the protection afforded against smallpox by the two types for lymph.

Influenza Vaccine Manufacture.

(Dr. C. G. Pandit, Dr. G. N. V. Krishnan and Mr. K. N. Gopalan.)

Early in the year attempts were first made to propagate influenza virus A in eggs from material obtained from the United States of America. On an experimental basis a few doses of vaccine were made. It was suggested that preliminary trials should be made at extended manufacture in order to evolve a technique for a larger scale manufacture when needed. The Government of India had agreed to meet the cost of such trials in the first instance.

At this time full details of technique of manufacture as adopted in United States of America were not available except certain essential details involved in the process. Precipitation of the virus by freezing and thawing and the technique of erythrocyte absorption and elution method were both studied. A suitable technique of manufacture by the latter method was worked out after studying the several factors, such as age of the embryo, suitable concentration of erythrocytes for absorption and the temperature and time factors in the absorption and elution of the virus. From further published reports it was noted that the technique evolved was more or less in agreement with that followed elsewhere.

The immunity producing properties of the vaccine were tested in mice following the technique prescribed by the South African Institute for Medical Research which was made available to us by the Public Health Commissioner. The results obtained were not, however, strictly comparable, in that the percentage mortality in control mice was not high though they had shown consolidation of lungs due to the action of the virus. Further attempts will be made in this direction after enhancing the virulence of the virus by mouse lung passage.

Diagnosis of virus influenza.—No studies have been made in India on the prevalence of types of the virus in epidemics of influenza. For this purpose, the Public Health Commissioner was requested to issue a circular requesting the Medical and Public Health authorities to send to this institute samples of sera from suspected cases of epidemic influenza. No samples were however received for such tests. It is proposed to make the influenzal antigen for distribution to facilitate undertaking of such tests at suitable centres.

SULPHANILYL-GUANIDINE IN THE TREATMENT OF CHOLERA.

1. *Treatment of hospitalised cases in the Infectious Diseases Hospital, Tondiarpet.*

(K. V. Venkataraman.)

A liberal supply of sulphanilyl-guanidine (hereafter referred to as sulphaguanidine) for controlled investigation of its value in the treatment of cholera was kindly placed at our disposal by the Public Health Commissioner with the Government of India, who also forwarded a note of a preliminary trial of the drug at the Campbell Hospital, Calcutta, with the request that the same dosage schedule and procedures be adopted so that the results may be comparable. Formal approval for the conduct of the investigation in the Infectious Diseases Hospital, Tondiarpet, was secured at a conference of the Commissioner, Corporation of Madras, the Health Officer, Corporation of Madras, the Medical Officer in charge of the Infectious Diseases Hospital, the Director, King Institute, and the officer in charge of the investigation. The general plan of investigation was agreed to and under the arrangements made, while the Medical Officer of the hospital remained in charge of the general management of the cases, the officer in charge of the general management of the cases, the officer in charge of the investigation had the authority to visit the hospitals and observe the progress of the cases, make the necessary examinations and the analysis of the experience were made at the King Institute, Guindy.

2. The trial was instituted at the Infectious Diseases Hospital, Tondiarpet, on 14th December 1942 when it first became apparent that an outbreak of cholera was imminent in Madras and a fairly large series of cases would become available at the hospital for an adequate trial of the drug. The investigation was in the first instance continued for a period of four weeks up to the 10th January 1943 during which time a total of 661 cases were admitted for the treatment of cholera. The peak of the epidemic was reached at the end of this phase of the investigation. After an interval of four weeks when the decline of the incidence was well established, the trial was again resumed on 8th February 1943, and continued for another four weeks up to 8th March. It was originally felt that the disease might be milder in the cases occurring during the period of declining incidence and the mortality rates low. But actually during the period of the second phase of the investigation no appreciable change in the severity of the disease was noted and case mortality rate remained at about the same level as before. The cases treated during the two periods have therefore been considered together in the subsequent portions of the report.

3. It has to be stated here that at the time of the commencement of the investigation the Infectious Diseases Hospital, Tondiarpet, served the entire City of Madras and continued to do so till the end of the year when the very large increase in the incidence of cholera placed too great a strain on its resources in accommodation, equipment and personnel and a second hospital had to be opened at Krishnampet to take over cases from some of the southern portion of the city. The medical personnel and senior members of the nursing staff of this overflow hospital were found by seconding some of the members on the staff of the Infectious Diseases Hospital, Tondiarpet, where they had been working from the beginning of the epidemic. It was therefore possible to follow an exactly similar procedure in the general management of the cases in both hospitals and the cases treated in both hospitals could be grouped

together without introducing any serious error. The second hospital started to function from 2nd January 1943 and was closed down on 15th February when all cases occurring in the city were again removed to the Infectious Diseases Hospital, Tondiarpet. Usually cases of cholera occurring in different parts of the city are discovered by the field staff of the Health department and removed to the hospital at Tondiarpet in a motor ambulance. Only a relatively small number of cases seek admission voluntarily or are referred to by their medical attendants. Practically every case of cholera reported during this period was sent to one or the other of these hospitals and has been included in the scope of investigation.

4. *Selection of cases.*—It was arranged to have all the cases clinically diagnosed as cholera to be numbered serially, assigning cases with odd numbers for treatment with sulphaguanidine and cases with even numbers for routine treatment. This arrangement was not strictly followed however, specially during the rush of the first few nights, when a majority of cases were treated by the routine method. But it may be stated that there was no conscious bias in favour of either line of treatment and the two groups represent a random selection.

5. *Treatment.*—The treatment of cholera cases usually followed in the hospital includes the intravenous administration of hypertonic saline according to Roger's method, exhibition of mist. prodiarrhœa 10–15 minims at short intervals and potassium permanganate in pills. Atropine sulphas gr. 1/100 is administered morning and evening and other measures of symptomatic treatment carried out as indicated. The administration of saline (quantity and interval between administrations) is guided solely by the condition of the pulse, state of dehydration and degree of collapse and is not controlled by the estimation of blood specific gravity. Hypertonic saline is invariably preceded by about a pint of Roger's alkaline formula. Severe febrile reactions after saline administration are not unusual and several cases complain of a severe headache. Cases treated by this method constituted the control group. The experimental groups received an exactly similar treatment with the exception that the prodiarrhœa mixture and potassium permanganate were omitted and sulphaguanidine was administered in the prescribed manner.

6. *Dosage of sulphaguanidine.*—An adult dosage of 20 gms. in the day, given 5 grm. *statin* and 2·5 gms. every 4 hours for 6 doses was adopted. A dose was repeated if it was rejected in the vomit within half an hour of its administration. 2·5 gms. three times a day was continued after the first 20 gms. if the patient continued to pass a large number of stools. In the case of children, an exact variation according to age or weight was not made, but children, below 5, received 12 gms. and those between 5 and 15, 16 gms. Blood and urine examinations could not be done to see if there were any toxic signs but there were no obvious toxic symptoms due to the drug in any of the cases.

7. *Bacteriological examination.*—Specimens of stool for bacteriological examination were obtained from the patients by a technician of the enquiry by the insertion of a sterile swab in the rectum and transferring it to boric-buffer-saline. These were transported to the laboratory and plated directly on a modified Wilson-Blair medium and again after enrichment by a modified Wilson-Blair method on Aronson and agar media. Occasionally the swabs were used to inoculate alkaline peptone water from which plates on Reiley, Aronson and agar media were streaked. Specific agglutinating sera containing the 'O' anti-body of *V. Choleræ* were used in the identification of colonies and non-agglutinating vibrios were not taken into account at all. Repeated daily examination were first attempted in each case to determine the period of excretion of vibrio but had to be given up during later stages owing to the necessity of conserving the resources of the laboratory for other urgent calls which came up at the time, when the examinations were restricted to one or two specimens from each case. The arrangement for obtaining specimens failed in the early days in cases which were admitted in the late evening and during nights from

whom no specimen was taken till the technician visited the next morning and some of the specimens which were taken by the hospital staff during the first two days and late hours were found to be unsatisfactory. Also some of the cases admitted during late hours died before specimen could be obtained.

8. There were 779 admissions to the cholera wards of the two hospitals during the periods under report. A diagnosis of cholera was excluded in 106 cases and 3 cases of cholera died immediately after admission and before any treatment could be instituted. Of the remaining 670 cases, bacteriological confirmation of the diagnosis by the isolation of *V. Choleræ* was obtained in respect of 427 cases Sulphaguanidine was administered to 314 cases (211 in the culture-positive group) while the remaining 356 (including 216 culture-positive cases) received the routine treatment usually followed in the hospital. Intravenous hypertonic saline was administered to cases in both groups according to indication and in other respects the management of the cases was similar in both. Two hundred and sixty-nine cases succumbed to the disease, 114 in the sulphaguanidine group and 155 among the controls.

TABLE No. I.

All cases of cholera.						Culture-positive cases.					
Sulphaguanidine group.			Control group.			Sulphaguanidine group.			Control group.		
A	D	Mortality rate per cent.	A	D	Mortality rate per cent.	A	D	Mortality rate per cent.	A	D	Mortality rate per cent.
314	114	36·3	356	155	43·5	211	62	28·4	216	83	38·4

9. The age and sex distribution of the cases in both groups is shown in Table II. All ages and both sexes are represented. The youngest case was in a child below one year whose mother was also in the hospital and the oldest, a man 80 years of age.

TABLE No. II.

Age group.	Age and sex distribution sulphaguanidine-treated group.				Control group.			
	Male.	Female.	Total.	Percentage of attacks in the group.	Male.	Female.	Total.	Percentage of attacks in the group.
Below 5 years	14	11	25	8·0	17	14	31	8·7
5–14 years	18	26	44	14·0	22	28	50	14·0
15–24 years	27	28	55	17·5	15	28	43	12·1
25–44 years	73	66	139	44·3	101	68	169	47·5
45 years and above ..	29	22	51	16·2	36	27	63	17·7
Total ..	161	153	314	100·0	191	165	356	100·0

No special predilection for a particular age group or sex is apparent. The largest number of cases occurred in the 25–44 years group. The cases treated with sulphaguanidine and the controls have a nearly similar distribution in age and sex, except that in the 15–24 years group, there were relatively more cases among those treated with sulphaguanidine than among controls, this difference being particularly striking in the number of males in that age group.

10. Mortality at different ages is shown in Table No. III. Two sets of figures are given in this and the following tables, one for all cases of clinic cholera and the other restricted to cases from whom *V. Cholera* was isolated.

TABLE No. III.

Mortality at different ages.

Age group.	All cases of cholera.						Culture-positive cases.					
	Sulphaguanidine-treated group.			Control group.			Sulphaguanidine-treated group.			Control group.		
	A	D	Mortality rate per cent.	A	D	Mortality rate per cent.	A	D	Mortality rate per cent.	A	D	Mortality rate per cent.
Below 5 years	25	10	40·0	31	14	45·2	13	6	46·2	17	8	47·1
5–14 years	44	16	36·4	50	15	30·0	32	6	18·8	34	7	20·6
15–24 years	55	13	23·6	43	13	30·2	44	7	15·9	24	6	25·0
25–44 years	139	50	36·0	169	70	41·4	90	28	31·1	106	38	35·8
45 and above	51	25	49·0	63	43	68·3	32	15	46·9	35	24	68·6
Total ..	314	114	36·3	356	155	43·5	211	62	28·4	216	83	38·4

A = Attacks. D = Deaths.

It will be seen that approximately two-thirds of the cases in the sulphaguanidine group and three-fifths of the cases in the control group have had their diagnosis established by cultural examinations. That the mortality rates for the culture-positive cases in both groups are somewhat lower than that for all cases is, as has already been mentioned in the previous report, due to the fact that specimens for cultural examination were not obtained from some rapidly fatal cases in both groups. This omission, however, has been nearly uniform in all age groups except that it has been somewhat more than the average in the "Below 5 years" group among the sulphaguanidine cases and in the "15–24 years'" group among the controls.

The mortality rate for all ages is 36·3 per cent for sulphaguanidine cases and 43·5 per cent for the controls. The difference in mortality rates is more marked when the culture-positive cases alone are considered being 28;4 per cent for the drug-treated cases and 38;4 per cent for controls. The highest mortality was in the "45 and above" age group, the other extreme age group, viz., "Below 5" ranking next. The lowest mortality was in the "15–24 years" group.

11. *Delay in hospitalization.*—It has already been mentioned that cases of cholera occurring in the city were first detected by the field staff of the Health department and transported in motor ambulances to the hospital where treatment was instituted without any further delay. Very few cases came to the hospital voluntarily or were referred by their own medical attendants. Owing to the generally backward condition of the communities in which most of the cases occurred, there was often a considerable delay after the onset of symptoms before the patient came to the notice of the Health staff. Very often, information of the occurrence of a case of suspected cholera in a household was given by a neighbour; many cases were discovered during periodical visits to the houses in an infected locality. Occasionally, the occurrence of a death in circumstances suggestive of cholera was the first information of the involvement of a new locality. In these circumstances, there was generally a considerable delay after the onset of symptoms before treatment could be instituted, the average delay in the 670 cases amounting to 18:3 hours. The shortest interval was one hour and the longest, 96 hours. In Table No. IV, the cases have been grouped according to the length of the delay before admission.

TABLE No. IV.

Delay in admission.

Delay in admission.	All cases of cholera.						Culture-positive cases.					
	Sulphaguanidine-treated group.			Control group.			Sulphaguanidine-treated group.			Control group.		
	A	D	Per cent.	A	D	Per cent.	A	D	Per cent.	A	D	Per cent.
0–6 hours	66	25	37·9	53	26	49·1	148	16	33·3	32	17	53·1
5–12 hours	97	42	48·5	112	45	40·2	59	18	30·5	73	24	32·9
12–18 hours	61	20	32·8	69	22	31·9	44	13	29·5	43	12	27·9
18–24 hours	44	16	36·4	75	38	50·7	29	8	27·6	39	17	46·2
Over 24 hours	46	11	23·9	47	24	51·1	31	7	25·8	29	13	44·8
Total ..	314	114	36·3	356	155	43·5	211	62	28·4	216	83	38·4

It is strange there should be no correlation between increasing delay and mortality rates. The subject is further discussed in paragraph 13.

12. *Severity of the cases at the time of their admission.*—The notes made at the time of admission of each case included, besides an account of the main symptoms prior to hospitalization as elicited by inquiry of the patient or his relative, observations on the state of dehydration and the extent of collapse as revealed by the general appearance, the condition of the skin and tissues and the state of the pulse and respiration. The degree of dehydration and collapse were recorded as "Mild," "Moderate" or "Severe." The question of taking blood specific gravity determinations was considered, to serve at least as an objective index of the degree of dehydration quite apart from their value in regulating the administration of intravenous saline. But the staff of the hospitals had not been accustomed to do this and it was not considered advisable to introduce an innovation for which adequate facilities were not available. It may be stated here that both in this and most other hospitals in the Province, clinical judgment has always been mainly relied upon to regulate the amount of saline transfused and the interval between transfusions.

TABLE No. V.

Cases grouped according to the severity at the time of admission.

Grade of severity.	All cases of cholera.						Culture-positive cases.					
	Sulphaguanidine-treated group.			Control group.			Sulphaguanidine-treated group.			Control group.		
	A	D	Mortality rate per cent.	A	D	Mortality rate per cent.	A	D	Mortality rate per cent.	A	D	Mortality rate per cent.
Mild	78	7	10·1	84	11	13·1	52	5	11·3	52	6	11·5
Moderate	106	24	22·6	122	37	29·8	79	14	17·8	70	16	22·9
Severe	130	83	63·6	150	107	71·1	80	45	53·2	94	61	64·9
Total ..	314	114	36·3	356	155	43·5	211	62	28·4	216	83	38·4

Table V shows the grouping of the drug-treated and control cases according to the severity of the clinical condition at the time of admission. The mortality rate ranges from 10 per cent in the mild cases to about 70 per cent in the severe cases. There is a slight but not appreciable difference between the mortality rates of drug-treated and control cases in the corresponding groups. Within these limits the advantage in favour of the drug treatment increases with increasing severity.

13. The relation of the severity of the cases to the delay in hospitalization is shown in Table No. VI.

TABLE No. VI.

Severity of cases in relation to delay in hospitalization.

Severity.	All cases of cholera. Delay in admission in hours.						Culture-positive cases. Delay in admission in hours.					
	0–6	6–12	12–18	18–24	Over 24.	Total.	0–6	6–12	12–18	18–24	Over 24.	Total.
Mild	34	46	32	30	20	162	20	31	19	22	12	104
Moderate	39	76	40	38	35	228	27	52	29	18	23	142
Severe	46	27	58	51	38	280	33	49	39	28	25	174
Total ..	119	209	130	119	93	670	80	132	87	68	60	427

It is seen that the proportion of cases of the different grades of severity is somewhat similar in the various delay periods. Making allowances for inaccuracies in the statement of the patient or his relative as regards the actual time of onset from which the duration of illness prior to hospitalization has been calculated, this would seem to indicate that the rapidity with which the disease takes on a grave turn varies in different individuals. The findings recorded in paragraph 11, viz., that the mortality rates bear no direct relation to the interval between onset of symptoms and institution of treatment become explicable on

this basis and it is seen from paragraph 12 that if treatment could be started while yet the symptoms were mild, the risk of a fatal termination is reduced to less than a sixth of that when treatment was allowed to be delayed till they became severe, whatever the interval that produces this change in the patient's condition.

14. An analysis of the data, to elucidate how far an assessment of the value of the drug may be vitiated, by the inclusion of a number of cases that dies within a few hours after admission before an adequate amount of the drug could be given, is made in Tables Nos. VII and VII (*a*). Here all fatal cases are grouped according to the length of time during which treatment was administered, based on the recorded interval between admission and death. In Table No. VII, they are further subdivided as mild, moderate and severe, according to their condition when admitted. It may be recalled that sulphaguanidine was given immediately after admission to all cases treated with the drug and repeated every four hours during the first 24 hours and thrice daily afterwards if indicated. The control cases received prodiarrhœa mixture and potassium permanganate at more frequent intervals. Intravenous hypertonic saline was administered to cases in both groups according to clinical indication. The stages shown in the tables have, therefore, a direct relation to the number of doses of sulphaguanidine given.

TABLE No. VII.

Duration of illness in fatal cases.

Condition when admitted.	Sulphaguanidine treated cases.				Control cases.			
	Mild.	Moderate.	Severe.	Total.	Mild.	Moderate.	Severe.	Total.
Total number of cases in group ..	78	106	130	314	84	122	150	356
Death in hours (after admission).	Number of deaths.				Number of deaths.			
0– 4 hours	..	3	5	8	..	..	14	14
4– 8 "	..	3	20	23	..	2	20	22
8–12 "	1	3	14	18	..	8	16	24
12–24 "	..	5	23	28	1	7	24	32
24–48 "	1	4	12	17	4	11	11	26
Over 48 "	5	6	9	20	6	8	23	37
Total ..	7	24	83	114	11	36	108	155

TABLE No. VII (*a*).

Duration of illness in fatal cases.

Culture positive cases.

	Sulphaguanidine treated cases.	Control cases.
Total number of cases	211	214
Death in hours (after admission).	Number of deaths.	Number of deaths.
0 – 4	6	6
4 – 8	10	8
8 – 12	6	11
12 – 24	15	17
24 – 48	9	14
Over 48	16	27
Total ..	62	83

It is seen that the proportion of deaths occurring in the first 24 hours after admission to the number of cases treated is very nearly the same in both groups being 24·4 per cent for drug-treated cases and 25·8 per cent for the controls. The mortality rate among those who have successfully tided over this period is 15·5 per cent for the drug-treated cases and 23·9 per cent for the

controls. In other words, those cases who had lived to receive at least 20 gms. of sulphaguanidine (proportionate amounts for lower-age groups) have a mortality rate which is only two-thirds of that of the cases in control group in the corresponding period. The same range of difference is found to obtain when cases in different grades of severity are considered. Thus the mortality rate (of those who have survived the first 24 hours) among the mild cases are 8 per cent for the sulphaguanidine and 12 per cent for the controls among cases of moderate severity, 11 per cent for drug-treated cases and 18 per cent for controls, and among the severe cases 31 per cent for the drug-treated and 45 per cent for controls.

15. It has been the experience of most workers who have used sulphaguanidine in the treatment of bacillary dysentery that the drug produces an immediate and striking improvement in the patient's general condition. No such effect was noticed in cases of cholera receiving the drug in the course of the investigation under report. There was no apparent difference in the clinical progress of cases treated with the drug and that of the control. The average amount of intravenous saline given to 200 cases that were under treatment with the drug and recovered was 2·88 pints per case against 2·63 pints per case for 201 recovered cases in the central group. The total amount of saline given to cases that died during the course of treatment was naturally limited by the occurrence of death. In Table No. VIII the cases are grouped according to their condition when admitted and the amount of saline given to each group is shown. Intravenous saline was not administered to very young children as it has been the experience of this hospital that they take it badly. They generally receive normal saline subcutaneously in addition to the rectal saline.

TABLE No. VIII.

Amount of intravenous saline given to cases which ultimately recovered.

All cases of cholera.				Culture-positive cases.			
Sulphaguanidine treated cases.		Control cases.		Sulphaguanidine treated cases.		Control cases.	
Number of cases.	Average amount of saline in pints.	Number of cases.	Average amount of saline in pints.	Number of cases.	Average amount of saline in pints.	Number of cases.	Average amount of saline in pints.
Mild 71 (8)	0·37	73 (10)	0·45	47 (6)	0·44	46 (7)	0·48
Moderate 82 (72).. ..	3·97	85 (65)	3·20	65 (59)	4·21	54 (45)	3·59
Severe 47 (47)	4·78	43 (42)	5·19	37 (37)	4·83	33 (33)	5·23
Total 200 (127)	2·88	201 (117)	2·63	149 (102)	3·18	133 (85)	2·92

NOTE.—The figures in brackets indicate the number of cases which actually received intravenous saline. The average is based on the total number in the group.

16. Another criterion of clinical improvement is the rapidity with which stools returned to normal. Stools were considered to be normal when they had become fæcal in character, semi-solid or solid in consistency and were not more than two in a day. The average time for this change to occur was 3·6 days for the drug-treated cases and 4·0 days for the controls, taking only the recovered cases into consideration. When culture positive cases alone are considered the figures are 3·8 days for the drug-treated cases and 4·1 days for the controls.

Suppression of urine.—There was a history of urinary suppression in 479 cases, 205 in the sulphaguanidine group and 274 in the control group. Death occurred in 181 (82 in the drug-treated cases and 99 in the controls), before this symptom was relieved and in 16 others there was a recurrence of anuria before death. In the remaining cases urinary secretion was re-established in 18–24 hours on an average there being no appreciable difference in the interval among drug-treated and control cases.

17. The time taken for the stool to become vibrio-free is yet another index of the efficacy of treatment. It was originally planned to make a bacteriological examination of daily stool specimens from each case till they were negative for *V. Choleræ*, but for reasons already stated such daily examination had to be

discontinued. In 62 cases treated with sulphaguanidine where the examinations were made at one or two days' interval during the relevant period when the stools became negative for the first time the average time taken was 3·5 days, which is the same as the average time in 66 cases in control group. It may be stated here that only vibrios agglutinated by specific *V. Choleræ* 'O' sera were considered, all other vibrios being rejected. All the strains isolated in the course of the present investigation were non-hæmolytic and belonged to the Ogawa sub-group.

18. Among the 570 cases considered in this report, there were 61 persons who had received a single dose of prophylactic anti-cholera vaccine six days or more previously to the attack. The diagnosis of cholera was established by the isolation of *V. Choleræ* in 22 of these. There were 7 deaths among them (5 among the culture positives).

19. The results of treatment of cholera in 10 other hospitals in the southern districts in the Province are summarized in Table No. IX for comparison with the results obtained in the cases included in this report. These relate to the period when the area served by these hospitals were involved in the same epidemic of which the outbreak in Madras was their part. Strains of cholera vibrio isolated in those districts during the course of this epidemic were also of the Ogawa sub-group.

TABLE No. IX.

Mortality rate in mufassal hospitals.

Hospitals.		Admissions.	Deaths.	Mortality rate per cent.	Period to which figures relate.
Infectious Diseases Hospitals, Madras—					
Sulphaguanidine treated cases		314 (211)	114	36·3	....
Routine treatment cases.		356 (216)	155	43·5	....
Mufassal Hospitals ..	1.	696 (514)	224	32·2	7 Nov. 1942 to 20 Mar. 1943.
	2.	314	138	43·9	3 Oct. 1942 to 20 Mar. 1943.
	3.	417	79	18·7	10 Oct. 1942 to 20 Mar. 1943.
	4.	283	112	39·6	26 Dec. 1942 to 20 Mar. 1943.
	5.	140	47	32·1	7 Jan. 1943 to 22 Apr. 1943.
	6.	98 (2)	35	35·5	19 Dec. 1942 to 20 Mar. 1943.
	7.	85	44	51·8	21 Nov. 1942 to 20 Mar. 1943.
	8.	54 (3)	27	50·0	7 Jan. 1943 to 20 Mar. 1943.
	9.	32 (1)	16	50·0	16 Jan. 1943 to 20 Mar. 1943.
	10.	23	15	65·0	16 Jan. 1943 to 20 Mar. 1943.

NOTE.—The parantheses denote figures in the number of cases which were culturally positive.

The general line of treatment followed in all these hospitals was similar to that in the control cases in the Madras series. They were given prodiarrhœa mixture and potassium permanganate and in some hospitals a mixture containing kaolin in addition. Atrophine was administered to cases requiring intravenous saline and pituitrin and other drugs according to clinical indications. Intravenous hyportonic saline administration was regulated only by clinical reaction and not blood specific gravity determination. With the exception of hospital No. 1, it was not the routine in these hospitals to seek a confirmation of the diagnosis by cultural examination of stools in each case. It may also be mentioned that since the Madras hospitals have always had facilities to have specimens from all cases examined bacteriologically, the criteria for a clinical diagnosis of cholera had been rather more rigid here than in some of the mufassal hospitals, which tend to include all cases of enteritis admitted during the prevalence of an epidemic of cholera in the locality as cholera. It is seen that with the exception of hospital No. 3, situated in the endemic area in the Cauvery delta the case mortality rates are from 32 to 44 per cent in the large hospitals and about 50 per cent in smaller ones.

20. *Summary and conclusions.*—The results of treatment of 314 cases of cholera with sulphaguanidine in the Infectious Diseases Hospitals, Madras, are

compared with those in 356 cases treated in the same hospitals by the routine methods usually followed in the institutions. An analysis of the age and sex incidents of the number of cases admitted after varying period of delay after the onset of symptoms and of the condition of the cases at the time of their admission show that the two groups were similarly constituted. The general management of the cases was similar in both groups except that those in one received the drug under trial according to a predetermined dosage schedule while those in the other received the drugs routinely used in the hospitals. The case mortality rate in the sulphaguanidine treated group was 36·3 per cent against 43·5 in the control group. These results are not in accord with the observations of Sir R. N. Chopra and his colleagues who have reported an effective reduction in the mortality rate in cholera by the use of this drug. It is to be noted, however, that in their series of cases, the mortality rate even among the control cases was only 6·38 per cent. They were probably dealing with a much milder infection in the endemic area of lower Bengal than is usually met with in the epidemics in this Province. The experience of L. B. Carruthers in Miraj, Central India, with a somewhat smaller series of cases, including 50 which were treated with sulphaguanidine was that the drug had no demonstrable value in the treatment of cholera. He had recorded a mortality rate of 14 per cent in cases treated with the drug against 17 per cent in his controls. The results of the present investigations show that a reduction in mortality among cases treated with the drug is only slightly less than that among the control cases, and there is no appreciable difference in the amelioration of symptoms or the rapidity with which *V. Choleræ* is eliminated. The comparison is somewhat more favourable for the sulphaguanidine treatment when culture positive cases alone are considered. It is also more favourable in the more severe cases and in the case of persons who had survived for at least 24 hours. It seems likely therefore that improvements in the measures adopted to combat the initial collapse and dehydration would result in a still greater percentage of recoveries with sulphaguanidine treatment. Also, the dosage schedule for sulphaguanidine adopted in this investigation was empirical, based mainly on the experience of the use of this drug in the treatment of bacillary dysentery where the lesions are primarily in the lower portions of the bowel, and the stools, though sometimes numerous, are generally scanty. In the absence of estimation of the concentration of the drug in stool, urine and blood for which facilities were not available, it is difficult to say if the main objective of obtaining a maximum concentration of the drug and maintaining that concentration in the intestines was achieved. It seems more probable that in a disease like cholera characterised by repeated and copious evacuations, exhibition of the drug in divided doses at more frequent intervals would result in maintaining an adequate concentration of the drug. A detailed investigation on a small series of cases which will include repeated estimations of sulphaguanidine in stools, urine and blood will afford data for a more rational dosage schedule.

Treatment under rural conditions.

(K. V. Venkataraman and V. Krishnamurthi.)

An investigation of the value of sulphaguanidine in the treatment of cholera in a group of hospitalized cases has been reported separately. In the very great majority of cases of cholera occurring in the rural areas of the Province facilities for hospitalization are non-existent, and most cases have to live through, or succumb to the disease in their own homes without the benefit of nursing attention or any special treatment worth mentioning. An investigation was undertaken in Ayakudi panchayat (Palni taluk, Madura district) to ascertain whether under these conditions sulphaguanidine would make any difference in the course of the disease.

2. In this village with a population of 17,000 the outbreak of cholera commenced on 17th December 1942 and lasted till the middle of February 1943; by the time the investigation was established on 18th January 1943 there had already been 170 attacks and 84 deaths from cholera. The general plan of the

investigation is briefly as follows: A medical officer with limited facilities was stationed at the panchayat to whom all the cases of cholera or suspected cholera were reported by the village sanitary inspector immediately on their occurrence. Careful records of the condition of the patients were made, specimens obtained for bacteriological confirmation of the diagnosis and alternate cases were put on sulpha-guanidine treatment, others serving as controls. The specimens were obtained by introducing sterile swabs in the rectum and this was inoculated in the preserving medium and mailed to the laboratory at King Institute, Guindy, where isolations of *vibrio-cheræ* were attempted.

3. The sulpha-guanidine treatment consisted in the initial administration of 20 gms. of the drug in the day followed by a dose of 2·5 gms. at 4 hourly intervals. Cases in the control group received mistura prodiarrhœa in 10 to 15 minimum doses at frequent intervals. Ordinarily a sufficient quantity of the drug for one or more subsequent doses was left with the patient's relative with instructions to administer. In the majority of instances the administration of the drug was supervised by the personnel of the enquiry during their subsequent visits to these patients. No saline was administered by the medical officer who was mainly to record his observations on the condition of the patients rather than to afford treatment. In this manner the condition approximates most closely to what actually prevails in rural area except for a record of the progress of the cases.

4. The trial in this village was brought to a close on 11th February 1943 when no further cases were available. Of the 77 cases included in this series 38 received sulpha-guanidine and 39 served as controls. There were 13 deaths in the sulpha-guanidine group and 20 among the controls. *Vibrio-choleræ* were recovered from 66 cases, 31 in the drug group and 35 among the controls. There were no deaths among the culturally negative cases. An analysis of the results obtained are given in the accompanying table.

AYAKUDI.

		Sulpha-guanidine cases.				Mist. Pro-diarrhœa cases.			
		Below 5 years.	5 to 14 years.	15 years and above.	Total.	Below 5 years.	5 to 14 years	15 years and above.	Total.
	Sex.	M. F.	M. F.	M. F.		M. F.	M. F.	M. F.	
	Attacks ..	1 0	1 4	19 13	38	1 1	3 0	11 23	39
	Deaths	1 0	0 1	6 5	13	1 0	2 0	7 10	20
Treatment commenced within.	0–6 hours ..	0	2/1	15/7	17/8	0	0	18/8	18/8
	7–12 „ ..	0	1/0	9/2	10/2	1/0	1/0	8/5	10/5
	13–18 „ ..	0	0	5/0	5/0	0	1/1	1/0	2/1
	19–24 „ ..	0	1/0	2/2	3/2	1/1	1/1	2/1	4/3
	Over 24 „ ..	1/1	1/0	1/0	3/1	0	0	5/3	5/3
		1/1	5/1	32/11	38/13	2/1	3/2	34/17	39/20
Severity on admission.	1	0	0	2/0	2/0	0	0	0	0
	2	0	0	9/2	9/2	1/0	0	10/1	11/1
	3	0	2/0	9/3	11/3	0	0	6/2	6/2
	4	1/1	3/1	12/6	16/8	1/1	3/2	18/14	22/17
		1/1	5/1	32/11	38/13	2/1	3/2	34/17	39/20
Treatment	Partial	1/1	1/1	6/6	8/8	1/1	1/1	15/15	17/17
	Entire	0	4/0	26/5	30/5	1/0	2/1	19/2	22/3
		1/1	5/1	32/11	38/30	2/1	3/2	34/17	39/20
Cultural examination.	Positives ..	1/1	2/0	28/11	31/12	2/1	3/2	30/17	35/20
	Negatives ..	0	2/0† 1/1*	4/0	7/1	0	0	4/0	4/0
		1/1	5/1	32/11	38/13	2/1	3/2	34/17	39/20

* Cultural examination not done in one fatal case.

Pro-diarrhœa cases	Partial	When 24 hours period is not passed.
	Entire	When 24 hours period is passed.
Number of attacks among inoculated.	..	10
	Sulpha cases ..	8
	Pro-diarrhœa cases.	2

One case among the sulpha group had the attack on the sixth day after inoculation and died. The other nine cases recovered.

Contact carriers in Cholera.

(K. V. Venkataraman.)

In the course of a previous investigation of cholera in Vizagapatam district in 1941 it was noticed that a proportion of the healthy people living in cholera-infected villages were found to excrete *V. Choleræ* in the stool while remaining apparently healthy. The opportunity of the widespread epidemic of 1942–43 was sought to be availed in order to extend these observations and ascertain the prevalence of these transient vibrio excretors in the community in the presence of cholera. Based on the epidemic reports and the result of the recent visit of Tinnevelly district, the Sermadevi Panchayat was selected for an intensive investigation of this aspect of the problem. But unfortunately before the field unit could be established in the village, cholera had subsided and only one case occurred in the village throughout the period of investigation. The experience therefore represents the conditions that prevailed in a community after the close of an outbreak.

2. The investigation of contact carriers was made in the Arsadi area of Sermadevi Panchayat. In its community of about 360 persons, 9 attacks and 6 deaths from cholera had been recorded during February 1943. Personal interrogation of all the residents revealed that there had been more cases ending in recovery which had not been reported. From none of these cases was any specimen submitted for cultural examination.

3. Two hundred and ninty-three residents co-operated in this investigation by submitting their stools for cultural examination and in responding to enquiry on the state of their health. Only one specimen could be obtained from each of 48 persons, 2 each from 59 and 3 or more from 186. The examinations were repeated in the case of persons who yielded *V. Choleræ* in some instances as many as 15 times till they became repeatedly negative. A total of 939 specimens were examined during the course of the survey. V. Choleræ were recovered from 19 persons (39 specimens).

4. The excretion of *V. Choleræ* was transient in the case of nine persons being found only once in the course of a number of examinations. From 5 persons the vibrio was recovered on two occasions with an interval of 2 to 17 days. Two others yielded the vibrio on 3 occasions over a period of 8 days and 1 on 4 occasions over a period of 12 days and the remaining two on 5 occasions over a period of 22 days. All these except 2 remained healthy throughout this period; 2 had diarrhœaic stools, 2 and 3 days after the first positive stool culture but specimens collected at this period were negative. The illness was of short duration; there was no vomiting and they made a rapid recovery.

5. One hundred and fifty persons included in this survey had received prophylactic inoculation against cholera—some a fortnight previously but the majority only a day or two before the commencement of the investigation. Eleven of these showed *V. Choleræ* in their stools in the course of the examination repeated here. The other 143 who remained uninoculated had among them 8 who excreted *V. Choleræ* in their stools. Of these 8 the vibrio was recovered only once in the case of seven persons and twice the eighth. The multiple isolations reported in paragraph 8 were all from positive contacts in the inoculated group.

6. Thirty-five strains of *V. Choleræ* isolated in the course of the examinations were tested with monospecific Inaba and Ogawa sera and were found to be of the Ogawas sub-type. They were all non-hæmolytic to goat cells.

7. The percentage of contact carriers remaining at the end of the outbreak of cholera in a rural community is the same as observed before in the previous epidemic at Vizagapatam; but the maximum period of excretion of the vibrio recorded in this investigation, viz., 22 days, is considerably in excess of the previous experience. The community included in the present survey consisted mainly of agricultural labourers with weaving as a secondary occupation; while there was no cholera in the experimental area at the time of these examinations a few cases continued to occur in the neighbouring villages where some of these people had gone to work.

8. With subsidence of cholera in the region the enquiry was terminated and the field staff withdrawn.

ENQUIRY ON THE STATISTICAL EVALUATION OF ANTI-CHOLERA INOCULATION IN THE MADRAS PRESIDENCY UNDER THE DIRECTOR, KING INSTITUTE, GUINDY, MADRAS, AND THE DIRECTOR OF PUBLIC HEALTH, MADRAS.

Apart from Russell's survey carried out in 1925–26 on limited statistical material on the comparative value of anti-cholera inoculation and oral administration of bili-vaccine in individual protection against cholera, it does not appear that surveys based on sufficiently large amount of statistical material have been carried out to assess the value of anti-cholera vaccine in the prevention and control of cholera. Apart from this, the anti-cholera vaccine which is used at present in this Province contains both Ogawa and Inaba strains of the cholera vibrio; it is probably different from the vaccine used in Russel's survey and no statistical data is available about its efficacy. For these reasons, it was considered that the very large number of anti-cholera inoculations done during the widespread and severe epidemics of cholera in the Province of Madras in 1942 and 1943 afforded an exceptionally good opportunity of an investigation to assess the value of anti-cholera inoculations in the conferment of personal immunity and of the influence of mass immunity in the prevention and control of cholera epidemics. Investigation of this subject was suggested to the Scientific Advisory Board of the Indian Research Fund Association in October 1943 and the proposal was readily accepted. Approval of the Madras Government was obtained and with the financial assistance from the Government and a subvention from the Indian Research Fund Association the present investigation was undertaken.

The following is the brief summary of the work done and conclusions arrived at:—

(i) A widespread and severe cholera epidemic involving the major portion of the Province of Madras prevailed in 1942 and 1943. The mortality from cholera in the two years was 53,000 and 117,000, respectively.

(ii) One of the chief measures of prevention and control adopted by the Public Health department of the Province was anti-cholera inoculation. Opportunity was taken of the very large number of inoculations done during the epidemic to carry out an investigation of certain aspects of inoculations in the prevention and control of cholera. The investigation was carried out in 2,350 villages in eleven districts of the Province. The total population of these villages was 2;99 millions of whom 1·18 millions were inoculated with prophylactic vaccine containing both Inaba and Ogowa types of vibro-choleræ. The vaccine was manufactured in the King Institute of Preventive Medicine and was administered in a single dose of 1 c.c.

(iii) According to the standard in the International Quarantine Regulations, a person to whom anti-cholera vaccines has been administered is deemed to be protected after six days have elapsed from the date of inoculation. Excluding the inoculated persons who did not satisfy the standard, there were 709,977 " protected " persons in whom 1,118 cases of cholera occurred; in 2,119,568 uninoculated persons, there were 34,336 cases of cholera. The case incidence rates in these two groups of population were 1·57 and 16·20, respectively, per 1,000. The incidence rate in the uninoculated was 10·3 times more than in the " protected " group.

Six hundred and twenty-seven out of 2,350 villages in the survey experienced a second outbreak of cholera after a month or more subsequent to the last case in the first outbreak. In these re-infected villages, the uninoculated population in the second outbreak was 541,808 whilst the protected population was 281,484, the greater proportion of whom had been inoculated in the first outbreak. In the second outbreak, 6,580 cases of cholera occurred in the uninoculated group and 241 in the " protected " group. The incidence rates per 1,000 of the respective population groups were 12·14 and 0·86. The incidence rate in the uninoculated was 14·2 times greater than in the " protected " group.

From the foregoing sets of results, there is definite proof that the protected persons are 12 to 14 times less susceptible to getting cholera, than the uninoculated persons in the community.

(iv) In the whole experience, there were 1,118 cases and 474 deaths from cholera in the " protected " group and 50,053 cases and 27,576 deaths in the

uninoculated group. The case fatality rates in the two groups are 42·4 per cent and 55·1 per cent, respectively, the proportion being 10·13.

The advantage derived from anti-cholera inoculation is not so much in recovery from the disease as in not getting it.

(v) According to the International Sanitary Convention, anti-cholera inoculation affords effective immunity only six days after the date of inoculation. As judged from the daily incidence of cholera in 1,181,724 inoculated persons on the several days following inoculation, it is seen that immunity is established even on the third day after the date of inoculation and it increases progressively during the succeeding week as well as the next four weeks.

(vi) Six hundred and twenty-seven out of 2,350 villages experienced a second outbreak of cholera, the intervals between the last case in the first outbreak—the first case in the second outbreak ranging from 1 to 12 months. If these re-infected villages are classified according to the intervals that have elapsed between the first and second outbreaks and the cholera incidence in the second outbreak among the uninoculated persons and the persons who had been inoculated in the first outbreak, is studied, the duration of immunity can be determined. From such a study, there is definite proof that the immunity conferred by anti-cholera inoculation lasts for a minimum period of five months and there is also strong evidence pointing to the continuance of the immunity up to 10 to 12 months.

(vii) From the data relating to the villages which experienced more than one outbreak of cholera in the present epidemic, there is definite evidence that, the greater the proportion of inoculations done in the first outbreak, the less are the chances of an occurrence of a second outbreak. Herd immunity therefore plays an important part during an epidemic on the occurrence of two or more outbreaks of cholera in a locality.

Researches on Water Purification Methods and Other Public Health Problems.

(By the staff of the Department of Water Analysis and Algæ Control.)

1. *Filter Research Station, Kilpauk, Madras.*—The main lines of research work conducted at the Research Station, Kilpauk, during these five years were on—

(1) Surface washing and sub-surface filtration in mechanical filters;

(2) Aeration of the Red Hills Lake water before passing it through sand filters worked at a semi-rapid rate; and

(3) Chloramination of the filtered water.

Other experiments carried out related to the effect of chlorinating the Red Hills Lake water before alumn coagulation, use of gooseberry logs for fluorine removal, use of sodium aluminate as an adjunct to alum coagulation, and the use of wood charcoal in sand filters for preventing production of sulphuretted hydrogen.

(a) *Surface-washing and sub-surface filtration in mechanical filters.*—It has long been recognized that the upper layers of the filter sand in a mechanical filter remove the maximum amount of suspended matter, and that formation of mud balls and cracks result from inefficient washing of the filters. Baylis had designed a method of surface washing of mechanical filters together with the usual upward wash. It was later shown that the surface washing arrangement could also be utilised as a sub-surface filtration system thus augmenting the quantity of filtered water obtained from a filter without increasing the rate of filtration or surface area.

A manifolding system of pipes was placed under the fine sand layer, at a depth of 12 inches, and air for washing was admitted through this system. It thus permitted simultaneous air and water wash, while the usual practice for washing filters is to admit air first and later water under pressure. Experiments carried out with this system of washing and filtration for over three months showed that the efficiency of washing was satisfactory. Filter runs on an average of 18 hours were obtained. The reduction in turbidity was nearly 80 per cent.

Samples of water drawn from the usual bottom manifolds, and the newly constructed subsurface manifolds were separately analysed to assess the degree of purification effected. Reduction in turbidity was almost the same in both the filtrates. The filtrate from the sub-surface system showed a somewhat poorer removal of bacteria, than that from the usual bottom manifolds.

(b) *Aeration of the Red Hills lake water.*—Previous experiments had demonstrated the value of passing the Red Hills lake water through aerating percolators followed by secondary sand filters in preventing the development of unpleasant tastes and odours in the filtered water. At the suggestion of Sri A. V. Raman, then Sanitary Engineer to Government, experiments were carried out first, on aerating the lake water through jet sprays before filtering it through sand filters, and later on, aeration with porous plates was also attempted. Another unit was also constructed in which the lake water after aeration and primary filtration by passage through a percolating aerator was re-aerated with the aid of jet sprays and filtered through a sand filter. An unaerated sand filter served as the control.

The system of double filters yielded the best results as regards clarity of the filtered water and its bacteriological quality, while the rest also gave very satisfactory results. H2S did not occur in the aerated and filtered waters while the control sand filter produced H2S in all runs. They, however, differed markedly with regard to their length of runs. The sand filters receiving water from percolating filters worked for an average of 79 days before clogging while the sand filter receiving jet aerated water, ran an average period of 25–34 days, which was similar to that of the control sand filter.

Aeration by jet sprays or percolators increased the dissolved oxygen content of the water generally by 15 per cent.

The exact chemico-biological factors concerned in arresting the production of H2S by this system of aeration and filtration are under study.

(c) *Chloramination.*—Chlorination of waters rich in organic matter usually results in taste and odour troubles due to the formation of complex organic compounds. The filtrates from the slow sand filters at Kilpauk require high doses of chlorine for effective sterilization due to the presence of organic matter and H2S. The addition of chlorine and ammonia (chloramine) has however, been tried extensively in America and England as a method of water sterilization avoiding post-chlorination tastes and odours. This method is best suited only for waters which have a pH of 7·6 or lower. Other advantages reported for chloramination are (1) lower dosage and (2) longer bactericidal effect. The latter is of particular advantage in cases where the treated water passes through a long distribution system, and also in preventing growth of bacteria and slims in the distribution pipes.

The filtrate from the mechanical filter at the experimental station was treated at the filter outlet with 0·3 part per million of preformed chloramine from June 1944. The ratio of ammonia to chlorine was maintained at 1 : 4. Samples of the treated water were analysed after varying contact periods. At the end of one and a half hours after addition of chloramine, there was a residual of 0·2 ppm. of chloramine and the coliform content of the water was reduced to 2–5 organisms per 100 c.c. After a contact period of 4 hours, coliform organisms were absent in 100 c.c. in all samples examined during this period. The experiments proved that the Red Hills lake water after filtration through gravity mechanical filters is quite suitable for sterilization with chloramines and that a minimum contact period of 4 hours with the sterilizing agent is necessary to obtain adequate bacterial destruction.

2. *Milk Bacteriology.*—The desirability of prescribing bacteriological standards for market milk in India was discussed by the Dairy Advisory Committee of the Indian Agricultural Research Council in February 1944, when it was decided that as a preliminary to the determination of such standards, the bacteriological quality of milk produced in various parts of India under different methods of production should be studied and "tentative" or "informative" standards arrived at.

Studies on the bacteriology of milk were started at the Institute in 1944 at the request of the Indian Council of Agricultural Research. Samples of milk produced under existing conditions of cleanliness were collected from privately owned individual cows, and from co-operative milk societies, and analysed at the laboratory both in their fresh state and after holding for four hours at atmospheric temperature. The bacteriological tests carried out were (1) a count of the total number of bacterial colonies in 1 c.c. of milk growing on agar at 37° C. in 48 hours, (2) the methylene blue reduction time, (3) the least volume of milk showing the presence of (*a*) coliform organisms and (*b*) streptococci and (4) presence of anaerobic spores in 5, 10 and 15 c.c. quantities of milk. Standard procedure was adopted in the analysis with small modifications. The results obtained were compared with those on samples collected under the following controlled conditions of cleanliness of the udder, the milkman's hands and the milking vessel:—

(1) The udder of the cow and the milker's hands were washed with dilute solution of bleaching powder and dried with sterilized towels. The milk was drawn into sterilized vessels.

(2) The udder and hands were washed with ordinary tap or well water and wiped dry with clean laundered towels. Milk was drawn into sterilized vessels.

(3) Udder and hands were washed with ordinary water but were not wiped dry. Milk was drawn into sterilized vessels.

(4) Udder and hands were not washed. Milk was drawn into sterilized vessels.

(5) Udder and hands were not washed. Milk was drawn into vessels rinsed with boiling water before milking.

(6) Udder and hands were not washed. Milk was drawn into vessels rinsed with cold water before milking.

Forty-six samples of milk produced under normal existing conditions and 772 samples produced under the controlled conditions were analysed. The studies so far conducted yielded the following results:—

(1) Under normal existing conditions, over 70 per cent of fresh samples showed a plate count exceeding 30,000 per c.c. and a methylene blue reduction time below 5 hours. In 50 per cent of the samples, coliform organisms were present in 0·01 c.c. and in smaller volumes. When kept for 4 hours at atmospheric temperature, more than 30 per cent of samples collected under the same conditions showed a plate count exceeding 1,000,000 while 50 per cent of these, reduced methylene blue in less than 3 hours and 56 per cent contained coliform organisms in 0·001 c.c.

(2) Milking into sterilized vessels after washing the udder and hands with dilute bleaching powder solution and wiping them dry with sterilized towels gave maximum improvement in quality and yielded samples of milk with the least colony count (cent per cent below 20,000) and the longest methylene blue reduction time (cent per cent above 7 hours). Ordinary washing, however, did not appear to effect significant improvement, when compared with samples drawn from non-washed udders. More than 80 per cent of samples produced from unwashed as well as from washed and dried udders, were up to the British standard for "Accredited Milk." Damp udders yielded a slightly lower percentage.

It was found that under present conditions, most of the initial bacterial contamination of the milk is derived from the use of dirty, improperly cleaned vessels. Rinsing the vessel with boiling water would effect marked improvement and yield samples of milk which would compare favourably with the use of sterilized vessels.

It was concluded that for keeping the bacterial content of milk low, and thus increase its keeping quality, attention must be directed to the cleanliness of the milking vessel. It is an additional advantage to wash the udders before milking and wiping them dry.

Further work on the bacteriological quality of pooled milk and buffalo's milk is in progress.

(3) *The use of leaves and flowers of Leucas Spp. as curative for malaria.*—At the instance of the Director of Public Health, Madras, some experiments were carried out to determine the efficacy of the leaves and flowers of the common South Indian species of *Leucas* as a curative for malaria. It was reported that this plant has some febrifugal properties and that a few cases of human malaria have been successfully treated with this.

The finely ground paste of the leaves and flowers of the plant was administered in one and two gram doses twice daily to monkeys and chicks infected with *P. knowlesi* and *P. gallinaceum* respectively. Suitable controls were also maintained. The infection took its normal course in the animals and birds and the plant did not appear to possess any definite and specific curative value as regards both avian and monkey malaria. Its value as a prophylactic measure was also tried and found unsatisfactory. Oral administration of the leaves and flowers failed to prevent malaria infection in monkeys and chicks when inoculated with blood containing the parasites.

(4) *Bionomics of anopheles sundaicus.*—*A. sundaicus* is one of the chief vectors of malaria in the Uddanam area of the Vizagapatam district and along parts of the narrow coastal strip south of Orissa. An investigation into the bionomics of the larvæ of this species of anopheles was undertaken at the request of the Director of Public Health, Madras, in September 1944. The relationship between the larval occurrence and the vegetation in the waters in which the larvæ breed was studied. A detailed survey of the aquatic vegetation—algae and other macrophytes—and the chemical composition of the waters in which the larvæ breed was carried out. It was shown that there was some positive correlation between algal growths and the intensity of larval breeding. Waters with floating aquatic macrophytes like *Azolla* or with a thick scum formed by *Microcystis* appeared to be unfavourable as breeding places while they breed freely in the presence of *Ceratophyllum*, *Nitella*, *Pithophora*, *Oscillatoria*, and *Enteramorpha*. Further work on this important problem is contemplated.

(5) *Utilization of vegetable oils as mosquito larvicides.*—Scarcity of mineral oils as a result of conditions created by the war, necessitated exploration into the possibilities of utilizing indigenous vegetable oils as mosquito larvicides, particularly those which have no other significant economic value.

Preliminary work on this problem established the fact that fixed vegetable oils like tobacco seed oil and groundnut oil do not possess all the characteristics required of an efficient larvicide, while essential oils like lemon grass oil, pine oil, citronella oil are quite satisfactory. These latter are, however, costly and are available only in small quantities. Blends of these with tobacco seed oil to which were added spread aiders and film stabilizers were therefore experimented with.

Blends with sulphonated castor oil, pine oil and 5 per cent soap solution and tobacco seed oil, lemon grass oil and soap solution were fairly satisfactory as regards their toxicity and spreading power, but the films formed by these were not quite uniform that mere ' misty ' as the oils dispersed in the form of droplets.

The addition of varying concentrations of common salt and starch to blends with tobacco seed oil, groundnut oil, lemon grass oil and citronella oil (ratio 10 : 5 : 3 : 2 respectively) for improving the spreading properties and stability, did not also yield satisfactory results, since the salt tended to increase the surface tension.

By replacing salt in the above blends with sugar and adding sulphonated castor oil, a blend with good spreading power could be obtained, which did not show any tendency to orient. The starch in the blend helped to stabilize the film in the form of a sheet.

In all these experiments, *Culex* larvæ were used to test the larvicidal action of the blends and the quantity of oil used was 1 c.c. per square foot of water surface. The larvicide prepared with sugar, starch, cotton seed oil, groundnut oil, sulphonated castor oil, lemon grass oil and citronella oil, showed 80 per cent kill in laboratory trials in 24 hours.

Some work carried out by the Army Entomological field unit in Assam and Ceylon incorporating 5 per cent of D.D.T. in mineral oil larvicides, as well as work carried out in West Africa, have shown good results, with the additional advantages of reduction in quantity of larvicide needed, and presence of residual toxicity in treated waters. D.D.T. is soluble in vegetable oils like tobacco seed oil, sesame oil, castor oil, and pine oil at the ordinary temperatures (27–30° C.) to the extent required to give an effective kill of larvæ. Experiments with a dozen vegetable oil blends containing D.D.T. were carried out and it was found that with a blend having good spreading power and stability, the incorporation of D.D.T. yielded 90–100 per cent larval kill.

The work carried out so far has shown the value of sugar and starch in improving the physical properties of vegetable oil larvicides and of D.D.T. in enhancing the toxicity. The stability of the film is important from the point of view of penetration of oil into the trachea of the larvæ and its consequent lethal effect on the larvæ. The role of film stability when D.D.T. is incorporated in the blend requires investigation. Studies also remain to be carried out on the optimum strength of D.D.T. for larvicidal purposes, without adversely affecting other desirable aquatic fauna and flora, the residual toxicity of vegetable oil blends with D.D.T. and the optimum quantity of oil per unit area of water surface.

Field trials on a semi-large scale have also to be carried out to assess the influence of surface vegetation, brackishness of the water, wind action, etc.

MISCELLANEOUS.

Incidence of Rh factor in Madras.

(By Dr. K. S. Ranganathan, Dr. C. S. Ramachandra Rao and Dr. N. R. Ratnakannan.)

The clinical significance of Rh factor is now well known. It is, however, as yet difficult to assess the clinical importance of this factor in this Province for two reasons. Firstly the number of transfusions performed is relatively smaller than in other countries, and the number of patients receiving repeated blood transfusions is smaller still. Secondly, careful enquiries have shown that the incidence of haemolytic disease of the new born has not been observed in this Province even in recent years since the discovery of the Rh factor. As a result, immune human sera have not been available for typing the population for determining the percentage of persons who look this factor. Three attempts were made to produce anti-Rh animal sera by immunizing Guinea pigs against rhesus monkey cells. Only a few of the Guinea pigs so immunized yielded sera of high titre, but in our experience it was found difficult to remove the anti-human agglutinins from these sera by the technique of Landsteiner and Wioner. This work is being pursued and it is proposed to use Rh negative red cells for absorption of the sera.

Fortunately a small supply of anti-Rh serum has been received from the Galton Laboratory Serum Unit, Cambridge through the courtesy of Dr. G. L. Taylor and the typing is in progress. The impression gained from the results obtained todate is that the percentage of Rh negative persons in Madras may be smaller than in Western countries. A small note on the incidence of Rh factor in Indians was published in " Nature ", March 30, 1946.

Tropical ulcer.

(By Dr. R. Seshadrinathan.)

A study of a hundred cases of " ulcus tropicum " collected in the City of Madras was made. The work was first started at the instance of the Superintendent of the Stanley Hospital, Rayapuram, but subsequently other sources also contributed cases, the chief being the Ramakrishna Mission Dispensary, Mylapore, Madras.

The diagnosis of these ulcers was made in every instance by the presence of Vincent's Fusiform bacillus alone, or in combination with Vincent's Spirochastes in the discharge. Most of the cases were among weavers, 43 per cent being in the age group of 15 to 30 years. More males were recorded in the list (88). Trauma was a fairly frequent factor in the causation of the ulcers (39 per cent gave a history of trauma). Nutritional defect noted in this group was the almost complete absence of milk and milk products in the diet.

Bacteriological observations made showed the presence of fusiform bacillus in every case. In 44 per cent, spirochastes were also present. In 44 cases, what has been noted as long forms of fusiform bacilli were found. These latter were sluggishly motile. The other organisms found were B. protous, B. pyocyanea and some cocci.

Pure cultures of the fusiform bacilli were obtained in a few instances on solid media (one per cent agar containing 25 per cent rabbit blood) incubated at 37° C. in an atmosphere of 90 per cent hydrogen and 10 carbon dioxide. Sub-cultures are difficult to maintain.

This work has been published in the *Indian Medical Gazette*, Volume LXXX, No. 7, July 1945.

The Role of Calcium in Chronic Fluorine Intoxication.

(By Dr. D. Narayana Rao.)

It has been found by some workers that good food regime improves and protects the organism against the effects of chronic fluorine poisoning. It was shown that several nutritional factors affect adversely by their absence or deficiency.

An experiment was devised to find out the effect of calcium on chronic fluorine poisoning in great detail. It was conducted on 9 monkeys, 3 being controls, three being given fluorine (10 mg. per kg. weight of body) and three being given identical amounts of fluorine together with calcium lactate.

The monkeys were radiographed before and after fluorine administration and in the case of 3 monkeys repeatedly during the course of intoxication. In those 3 monkeys, mineral balance of calcium, phosphorus, magnesium and fluorine was studied. Blood chemistry was also followed in those three monkeys.

The work was done in the King Institute, Guindy, and the Bio-Chemistry department of the Madras Medical College.

Findings.—Calcium was found to be depleted from the body during fluorine intoxication. Osseous system was the sufferer. Bones got depleted of some calcium but not phosphorus. Administration of calcium gave rise to a positive calcium balance. Phosphorus metabolism was upset as a result of calcium being given as a lactate. In chronic fluorosis, magnesium was little altered. Calcium was found to increase markedly the elimination of fluorine more through the fæces than urine; it was also found to reduce the fluorine content and increase the calcium content of those bones. That calcium was found to protect the bones from periosteal reaction was shown radiologically as also histologically. That calcium depletion and consequent fragility of the bones were prevented was seen from chemical analysis of bones. In calcium fed monkeys, bones were found to be approaching the normals in their composition, tensile strength and general appearance. Calcium administration did not prevent mottling of the teeth. Radiologically, periosteal reaction was found in bones like radius, ulna, spine, etc., while in calcium and fluorine fed monkeys, there were no periosteal changes. The periosteal changes, if present, were found to synchronise with the increased serum phosphates.

The investigation formed the subject of a thesis submitted to the University of Madras for the M.Sc. degree. The full results will be published in due course.

LIST OF PAPERS PUBLISHED.

List of papers contributed by the members of the staff and attached enquiries under the I.R.F.A. published in journals during the period 1st October 1941 *to March* 1946.

1941–42.

1. Venkataraman, K. V. and Ramakrishnan, C. S. A preserving medium for the transmission of specimens for the isolation of vibrio choleræ. (I.J.M.R., Vol. XXIX, No. 4, October 1941, pp. 681–684.)

2. Seshadrinathan, N. and Timothy, B. Distribution of blood groups in a Madras population. (I.J.M.R., Vol. XXX, No. 3, July 1942, pp. 445–447.)

3. Shortt, H. E., Menon, K. P. and Seetharama Iyer, P. V. The natural host of Plasmodium Gallinaceum (Brumpt 1935). (Journal of the Malaria Institute of India, Vol. IV, No. 2, December 1941, pp. 175–178.)

4. Seetharama Iyer, P. V., Shortt, H. E. and Menon, K. P. The stage of Plasmodium Gallinaceum found in the incubation period—second observation. (Journal of Malaria Institute of India, Vol. 4, No. 2., December 1941, pp. 179–180.)

5. Seshadrinathan, N. On Laboratory Diagnosis of fevers. (The Antiseptic, June 1942.)

6. Ananthanarayana Iyer, A. and Subba Rao, K. A preliminary study of the position of the apex of the heart in angular measurements. (Journal of the I.M.A., Vol. XI, No. 3, December 1941.)

1942–43.

7. Ranganathan, K. S. On the role of transfusion and infusion in the treatment of wound shock. (The Antiseptic, Madras, October 1942.)

8. Hawley, H. Reichert. Value of Butter-fat. (Current Science, Vol. XII, No. 5, May 1943, p. 153.)

9. Seshadrinathan, N. and Venkataswamy, S. Coliform organisms from the urinary tract. (I.J.M.R., Vol. XXXI, No. 1, May 1943, pp. 1–3.)

1943–44.

10. Nathan, N. S. A simple arrangement for transferring blood and blood serum from capsules into tubes for serological tests without the use of pipettes. (Indian Medical Gazette, May 1944, Vol. LXXIX, No. 5, pp. 206–207.)

1944–45.

11. Seshadrinathan, N. Tropical ulcer, a study of one hundred cases collected in the City of Madras. (Indian Medical Gazette, Vol. LXXX, No. 7, July 1945, pp. 344–346.)

12. Narayana Iyer, S. The Bellier figure as an analytical constant of vegetable oils and its use in detecting adulteration in them. (Current Science, Vol. XIV, No. 7, July 1945, pp. 177–178.)

1945–46.

13. Ranganathan, K. S., Ramachandra Rao, C. S. and Ratnakannan, N. R. Incidence of the Rh. Factor in Indians. (Nature, Vol. 157, dated 30th March 1946, p. 411.)

THE KING INSTITUTE, GUINDY, *5th December* 1946.

C. G. PANDIT, O.B.E., PH.D., D.P.H., D.T.M., F.N.I.
Director.

TABLE No. I-A.

Financial statements—King Institute, Guindy.

Receipts.

Details.	1941–42.	1942–43.	1943–44.	1944–45.	1945–46.
	RS.	RS.	RS.	RS.	RS.
Sale proceeds of sera and vaccines ..	48,715	1,01,309	2,37,873	1,70,708	2,74,822
Recoveries of overpayments	715	380	90	627	1,705
Collection of payments for services rendered.	56,654	59,275	40,057	83,236	1,60,992
Miscellaneous	3,746	3,743	5,364	4,326	10,248
Total ..	1,09,830	1,64,707	2,83,384	2,58,897	4,47,767
Deduct refunds ..	(—)30	(—) 27	(—) 273	(—) 39	(—) 130
Grand total ..	1,09,800	1,64,680	2,83,111	2,58,858	4,47,617

Expenditure.

Details.	1941–42.	1942–43.	1943–44.	1944–45.	1945–46.
(a) Pay of Officers voted and charged.	1,09,621	1,01,616	1,05,771	1,10,630	1,41,170
Pay of Establishment	75,911	83,967	87,051	96,985	1,06,668
Travelling and other allowances ..	6,946	8,796	12,434	15,408	28,772
Dearness allowance	632	7,129	19,214	35,591	73,757
Pay of skilled labourers and menials.	9,900	12,404	15,773	15,060	14,287
Dearness allowance to menials ..	482	4,189	9,999	11,512	21,072
Telephone charges	753	546	984	1,986	1,473
Books and Periodicals	2,425	1,064	1,175	3,124	1,882
Service postage and telegrams ..	15,227	15,115	14,920	22,694	49,094
Cleaning charges and office expenses.	1,703	2,379	3,544	3,522	6,903
Rates and taxes	6,897	6,669	6,977	6,762	6,539
Purchase of sera and vaccine ..	1,33,884	1,10,802	82,301	1,27,906	1,63,572
Instruments and chemicals ..	83,969	1,63,727	2,42,703	1,59,915	2,56,699
Purchase and feed of calves and other animals.	15,363	16,233	42,140	47,511	75,429
Motor car maintenance charges ..	2,208	3,045	3,335	2,085	4,740
Electric current	5,902	7,367	6,965	6,827	8,974
Customs duty	8,190	11,555	3,363	9,143	16,708
Other contingencies	11,632	20,573	14,915	10,160	21,738
Total ..	4,91,445	5,77,238	6,73,564	6,86,521	9,99,557
(b) Experimental Filter Station, Kilpauk—					
Pay of Establishment	2,201	2,298	2,383	2,614	2,731
Dearness allowance	..	1	381	490	852
Electric current	507	670	703	832	879
Instrument and chemicals.. ..	653	1,119	1,482	637	443
Other charges	644	1,299	936	1,363	1,440
Dearness allowance to menials ..	..	52	189	246	423
Grand total ..	4,95,450	5,82,677	6,79,638	6,92,703	10,06,325
Net cost to Provincial Revenues ..	3,85,650	4,17,997	3,96,527	4,33,845	5,58,708

TABLE No. I-B.

Financial statement for the period from 1st October 1944 to 31st March 1946.

(For explanation, see General Review—Paragraph 3.)

Particulars.	RS.
I. Bacteriological and chemical examinations..	6,46,388
II. Bacteriological vaccines supplied	2,73,250
III. Value of cultures for autogenous vaccines..	1,328
IV. Vaccine lymph	7,02,572
V. Sera and special vaccines bought and sold to Government hospitals, private bodies, etc.	4,79,863
Total ..	21,03,401

TABLE No. I-B—*cont.*

Financial statement for the period from 1st October 1944 to 31st March 1946—cont.

Government Analyst Section.

Particulars.	RS.
I. Contribution from local bodies for working the Food Adulteration Act including fees for extra samples.	1,23,475
II. Estimated value of examinations done for Government bodies and others ..	28,350
III. Government share of revenue from fines, viz., 10 per cent of the total fines and half the excess if any, over contributions as per G.O. No. 5336, P.H., dated 12th November 1940.	1,42,824
Total ..	2,94,649
Grand total ..	23,98,050

Expenditure.

Salaries, overseas pay, leave salary	4,85,111
Contingencies.	
Salaries of menials	48,777
Other contingencies	1,02,323
Special stores—Sera and vaccine—	
Stores	3,61,161
Sera	2,26,512
Customs	24,464
Electric current	15,251
Calf purchase	10,679
Rates and taxes	12,984
Total ..	12,87,262
Amount borne by other budget on Institute account.	
Proportionate cost of management and supervision by the Surgeon-General and his staff.	3,030
Cost of audit on construction and repair of buildings and electric installation ..	376
Maintenance charges of buildings and electric installation	29,240
Depreciation and interest charged on.	
(*a*) Buildings	55,560
(*b*) Electric current and machinery	9,501
Cost of stationery, clothing and printing	9,642
Superannuation allowance and pensions	340
Total ..	1,07,689
Grand total ..	13,94,951

TABLE No. II.

Type of vaccination (1st October 1944 to 31st March 1946).

Serial number and type.	Total number of cases verified.	Total number of cases not verified (unknown).	Total.	Percentage of each type to total cases done.
1 Primary vaccination ..	915,953	196,758	1,112,711	14·7
2 Secondary vaccination ..	64,608	..	64,708	0·9
3 Revaccination	4,324,507	2,048,819	6,373,326	84·4
Total ..	5,305,068	2,245,577	7,550,645	

	Cases.	Percentage of each type to the total quantity issued.
A. Total quantity of vaccine lymph issued at four insertion per case.	11,241,145	..
B. Total quantity of vaccine lymph used for vaccinating cases in 1, 2 and 3 calculated at four insertion per case	4,363,982	38·8
C. Total vaccine lymph unaccounted for	6,877,163	61·2

TABLE No. III.

Primary, secondary and revaccination results for 1944–46
(1*st October* 1944 *to* 31*st March* 1946).

(The districts are in order of case success rates in primary vaccination.)

Serial number and districts.	Primary vaccination. Cases success. Total cases.	Percentage of case success.	Insertion success. Total number of insertions verified.	Percentage of successful insertion.	Re-vaccination. Total cases.	Percentage of case success.	Total number not verified (unknown).	Total vaccination.	Percentage of lymph unaccounted for.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1 Ramnad ..	10,795	97·7	42,142	90·5	27,860	20·8	17,307	56,974	92·8
2 Salem ..	6,348	96·1	24,960	81·9	12,030	19·1	15,441	33,921	96·2
3 Chittoor ..	17,229	95·9	66,735	85·3	59,984	19·5	37,780	114,749	64·0
4 Coimbatore	23,480	95·2	93,494	78·4	32,758	16·7	30,998	87,518	81·7
5 Malabar ..	37,020	94·4	144,016	81·1	170,213	19·9	83,759	292,481	74·6
6 Madura ..	61,546	93·1	243,393	79·1	243,593	19·4	177,050	487,498	20·6
7 Chingleput ..	9,012	93·1	40,328	67·2	46,837	16·1	28,522	84,767	75·5
8 South Kanara.	18,608	92·6	71,814	74·9	74,733	18·1	49,641	144,593	60·1
9 Nilgiris ..	4,811	92·5	19,034	75·4	20,912	13·5	12,413	38,258	21·3
10 Cuddapah	4,155	92·3	16,524	78·1	20,666	13·4	9,016	34,041	68·0
11 Bellary ..	32,326	91·3	127,594	69·7	75,070	12·3	51·062	160,828	18·8
12 Trichinopoly.	51,663	91·1	202,614	72·3	204,598	16·8	145·010	404,569	24·9
13 North Arcot.	51,445	90·1	200,814	72·5	148,577	12·9	126·949	329,069	25·9
14 Tanjore ..	2,681	89·6	10,630	72·2	8,640	12·4	5,831	18,150	98·3
15 Tinnevelly ..	25,037	88·5	99,500	68·3	109,881	11·6	61,156	199,209	67·9
16 Kistna ..	23,364	87·9	99,704	66·6	62,000	16·7	51,879	139,512	54·0
17 Anantapur ..	44,472	87·8	177,227	66·7	83,796	12·7	34,704	166,219	16·1
18 West Godavari.	20,653	87·3	77,029	72·0	64,892	15·5	51,734	138,161	68·9
19 South Arcot	34,933	87·1	138,144	68·0	172,399	10·8	123,411	334,333	56·5
20 Nellore ..	37,396	82·4	147,367	59·1	126,157	8·1	73,222	240,713	43·2
21 Kurnool ..	11,866	81·8	46,338	56·0	29,221	4·9	19,067	60,582	74·7
22 Guntur ..	31,749	79·1	117,449	59·8	133,869	8·5	111,622	279,106	55·8
23 East Godavari.	69,892	78·1	270,299	56·9	247,401	12·3	163,679	493,432	16·5
24 Vizagapatam.	75,022	74·8	292,526	2·2	317,473	12·6	200,146	601,871	43·2
District Total ..	707,503	86·9	2,770,575	68·1	2,493,538	14·2	1,680,487	4,940,554	62·2
25 Madras Corporation.	44,338	99·7	175,580	93·8	344,547	4·1	200,533	598,442	41·7
26 Municipalities.	157,242	95·9	606,376	85·1	1,482,474	17·7	355,363	1,997,654	3·41
27 Other Bodies.	6,870	83·4	6,552	97·7	3,498	26·6	194	13,995	99·05
Grand total ..	915,953	89·1	3,559,083	72·3	4,324,507	14·6	2,245,577	7,550,645	61·2

TABLE No. IV.

Bacterial vaccines and other supplies (1*st October* 1944 *to* 31*st March* 1946).

A. Prophylactic vaccines.

Serial number and name of organisms.	Stock doses.	Autogeneous doses.
1 Prophylactic cholera	9,346,937	
2 „ Typhoid, para Typhoid T.A.B.	186,632	
Total ..	9,533,569	

B. Therapeutic vaccine.

Pyogenic group.

3 Staphylococcus vaccine albus and aurous	16,642	78
4 Streptococcus Staphylococcus vaccine	13,168	42
5 „ Pyogenes	5,477	108
6 „ Pemphigus	107	..
7 „ Pyorrhea	1,970	..
8 „ filarial	20,311	..
9 „ B. Acne	964	..
10 Streptococcus and friedlander	..	12
11 Staphylo·occus and B. Diphtheroid	..	18
12 „ aureurs	..	194
13 „ albus	..	42
14 „ B. Pyocyaneous	..	6
15 B. Proteins	..	18
16 B. Pyocyaneous	..	54

TABLE No. IV—*cont.*

B. Therapeutic vaccine—cont.

Pyogenic group—*cont.*

Serial number and name of organisms.	Stock doses.	Autogeneous doses.
17 B. Morgani	..	6
18 B. Faecealis alkaligenes	..	6
19 B. Coli	..	6
20 Streptococcus and pseudo asiaticus	..	6
21 B. Friedlander	..	6
22 Pneumococcus and staphylococcus	..	6
23 Staphylococcus and B. Acne	..	6
Intestinal group.		
24 B. Typhosus curative	67	..
25 B. Typhosus and Para A and B mixed	5,540	..
26 B. Facecalis alkaligenes	..	6
27 B. Coli	..	6
28 Streptococcus	..	6
Respiratory group.		
29 Compound catarrhal vaccine	5,019	24
30 B. Pertursis combine curative vaccine	1,253	..
31 „ Prophylactic vaccine	919	..
32 Compound influenza catarrhal vaccine	83	..
33 Pneumococcus vaccine	54	24
34 Streptococcus		474
35 „ plus B. Friedlander		36
36 „ N. Catarrhals		222
37 „ N. Catarrhals plus B. Influenza	..	12
38 „ Pneumococcus	..	192
39 „ Pneumococcus and Staphylococcus	..	6
40 „ Pneumococcus and B. Influenza	..	12
41 „ and B. Faecalis Alkaligenes	..	6
42 „ Staphylococcus and N. Catarrhals	..	6
43 N. Catarrhals	..	12
44 „ and Penumococcus	..	30
45 B. Influenza and B. Pneumococcus	..	12
46 „ B. Penumococcus and N. Catarrhals	..	6
47 B. Influenza and N. Catarrhals	..	6
48 B. Friedlander	..	60
49 Streptococcus and Staphylococcus	..	24
50 „ and B. Influenza	..	30
51 B. Friedlander and Penumococcus	..	6
52 „ and N. Catarrhals	..	6
53 Staphylococcus	..	42
54 B. Diphtheroid	..	30
55 „ and N. Catarrhals	..	6
56 „ and Streptococcus	..	54
57 „ Staphylococcus and N. Catarrhals	..	12
58 B. Pyocyaneous	..	6
59 „ Streptococcus and Pneumococcus	..	6
60 Diphtheroid and Staphylococcus	..	42
61 „ and Pneumococcus	..	6
62 Streptococcus and B. Diphtheroid and B. Friedlander	..	6
63 „ and B. Diphtheroid	..	6
64 „ and Diphthcoccus mucosis	..	6
65 B. Friedlander and B. B. Influenza	..	6
66 Pneumococcus and N. Catarrhals	..	6
Genity urinaro group.		
67 Gonococcus vaccine	19,570	..
68 Compound gonococcus vaccine	2,827	..
69 B. Coli vaccine	1,853	84
70 „ and Streptococcus puerperal	400	..
71 „ Puerperal vaccine	205	..
72 Streptococcus vaccine	833	12
73 B. Faecealis alkaligenes	..	18
74 B. Pyocyaneous	..	6
75 B. Morgani	..	18
76 B. Coli and Streptococcus	162	12
77 Staphylococcus aureus	..	6
78 Staphylococcus and B. Diphtheroid	..	12
79 Staphylococcus and Pneumococcus	..	6

TABLE No. IV—*cont.*

B. Therapeutic vaccine—cont.

Mixed group genito urinary and intestinal groups.

Serial number and name of organisms.	Stock doses.	Autogenous doses.
80. Staphylococcus and enterococcus	..	6
Miscellaneous.		
81 T.A.B. vaccine dilution 1 in 4 for protein stock treatment	2,677	..
82 Old tuberculin for V.P. test	721	..
83 „ for Montax test	324	..
84 „ undiluted	11	..
Total ..	101,157	2,252

Miscellaneous supplies.

85 Cultures for various organism	147 tubes and 1 plate
86 Bacteriological suspensions for agglutination tests	26,754
87 High Titre sera	172
88 Various sterlie materials for obtaining cultures	2,991
89 Wassermannx and Wrights tubes for collection of blood	85,022
90 Various media	75,433 tubes, 162 bottle and 4,300 c.c.
91 Peptone solution	156

TABLE No. V.

Statement showing the Pathological specimens examined in the laboratories of the State-public, Local Fund, Private aided hospitals and dispensaries in the Madras Presidency during the year from 1st *October* 1944 *to* 31*st March* 1946.

Name of the Institution—King Institute, Guindy, Clinical and Pathology Section.

Serial number. (1)	Part. (2)	Description. (3)	Number examined. (4)	* Number positive. (5)	Remarks. * Details regarding positive to be given here. (6)	Total number of column (6). (7)
		Part I.—Microscopical and Bacteriological tests.				
1	A. Blood films		243	25	Malaria .. 21	25
					Microfilaria 4	
					Relapsing fever ..	
					Spirochaetes ..	
					Leishmania donavani. ..	
					Other organisms ..	
2	Do.	Red cells.	..	..	..	
		White cells	121	0		
3	Blood for total count.	Red cells	3	0		
		White cells	..	..	..	
4	Blood for Hæmoglobin		1	0		
5	Blood for grouping		Nil.	Nil.		
6	Blood for Agglutination tests.		4,585	2,330	Enteric group—	2,330
					B. Typhosus .. 421	
					B. Paratyphosus—	
					A .. 39	
					B .. 330	
					C .. 40	
					More than one organism. 1,489	
					Dysentery group—	
					B. Shiga .. 3	
					B. Flexner .. 5	
					Weil-Felix reaction—	
					Ox 2 .. 1	
					Ox 19 .. 1	
					Ox k .. 1	
					Malta fever—	
					B. Melitensis ..	
					B. Abortus ..	
					Other organisms ..	

Table No. V—*cont.*

Statement showing the Pathological specimens, etc.—cont.

Part I.—Microscopical and Bacteriological tests—cont.

Serial number.	Part.	Description.	Number examined.	*Number positive.	Remarks. * Details regarding positive to be given here.	Total number of column (6).
(1)	(2)	(3)	(4)	(5)	(6)	(7)
7		Blood for—				
		Aldehyde test	10	5		5
		Antimony test	8	5		5
8		Blood for culture	475	121	B. Typhosus .. 28	121
					B. Paratyphosus—	
					A	
					B 7	
					C 1	
					Other organisms. 85	
		Part A, total ..	5,446	2,486		
9	B.	Cerebrospinal fluid for—				
		Cell count	147	0	N. Intracellularis ..	10
		Microscopical examination.	128	0	Other organisms ..	
					N. intracellularis. 7	
		Cultural examination.	278	10	Other organisms. 3	
		Part B, total ..	553	10		
10	C.	Urine for—				
		Qualitative Quantitative microscopical examination.	32	0	B. coli 77	109
					Enteric group .. 2	
					Other organisms. 30	
		Cultural examination.	666	109		
		Part C, total ..	698	109		
11	D.	Fæces for—				
		Microscopical examination.	246	10	E. Histolytica .. 1 (vegetative and cystic forms).	10
					Ova	
					Cellular exudate 9	
					Others	
		Cultural examination.	2,198	512	V. choleræ .. 499	512
					Dysentery group. 8	
					Enteric group .. 3	
					Other organisms. 2	
		Part D, total ..	2,444	522		
12	E.	Specimens of pathological fluids, etc., for —Microscopical examination.	2,889	629	M. Tuberculosis. 21	629
					M. Lepræ .. 4	
					N. Gonorrhœ	
					T. Pallidum	
					P. Pestis .. 577	
					C. Diphtheria .. 27	
					Other organisms. ..	
		Cultural examination.	659	78	M. Tuberculosis. 15	78
					C. Diphtheria .. 56	
					Other organisms. 7	
		Part E, total ..	3,748	707		
13	F.	Tests on animals with specimens of pathological fluids, etc., received.	193	25	M. Tuberculosis 6	25
					C. Diphtheria .. 8	
					Other organisms ..	
					Friedman test for pregnancy. 11	
		Part F, total ..	193	25		
		Part I, grand total ..	13,082	3,859		

TABLE No. V—*cont.*

Statement showing the Pathological specimens, etc.—cont.

Part II.—Pathological examinations.

Specimen for histo-pathological examination—					
Biopsy	134	..	Tumours—		
			Benign ..	34	134
			Malignant ..	22	
			Others	78	
Post mortem ..	32	..	Tumours—		
			Benign ..	..	32
			Malignant ..	..	
			Others	32	
Rare post mortem specimens preserved.					
Part IV, Grand total.	166	..			
V. Any other examinations done.	Nil.	..			

Part III.—Serological tests.

	Number examined.	Number positive.
Specimens for Kahn tests	52,947	14,663
Specimens for Wassermann tests	6,385	2,023
Cerebro-spinal fluid for tests	998	260
Total number of specimens ..	60,330	16,946
Specimens for both Kahn and Wassermann tests	19,064	8,740
Total serological tests	79,394	25,686
Cerebro-spinal fluid for gold solution test	718	192
Number of specimens for Kahn verification test	197	..
Bloods found lysed or anti-complementary on testing..	897	..
Grand total ..	81,206	25,878

TABLE No. V-A.

Reagents supplied—1st October 1944 *to* 31*st March* 1946.

Bullock Heart Extract for Wassermann test	240 c.c.
1 per cent Cholestrol solution for Wassermann test ..	4 c.c.
Anti-sheep Amboceptor	48 c.c.
Kahn Antigen	708 c.c.

TABLE No. V-B.

Sterile solutions sections Table showing the number of ampoules of sterile solutions supplied during the period 1941 *to* 1946.

	1941–42.	1942–43.	1943–44.	1944–45.	1st October 1945 to 31st March 1946 (6 months).
25 per cent glucose solution	40,039	31,028	70,089	110,842	54,406
5 per cent calcium chloride, 5 c.c. ..	15,303	17,415	17,580	21,146	2,106
Quinine bi-hydrochloride 10 grains, 2 c.c.	7,972	15,388	31,320	..	..
10 per cent calcium chloride, 10 c.c. ..	5,580	6,858	6,139	512	1,153
Calcium gluconate, 5 per cent, 5 c.c. ..	..	..	..	..	5,842
Pyrogen free normal saline, 20 c.c. ..	..	..	..	..	3,381
Pyrogen free distilled water, 20 c.c. ..	..	..	..	..	3,929
Miscellaneous ampoules such as morphia, Novocaine, sodi citras Percaine, Mag sulph, etc.	6,560	4,873	5,606	6,561	654
Five per cent glucose saline bottles of 20 oz. each (supplied to Government General Hospital, Madras and King George Hospital, Vizagapatam).	..	93 (bottles)	..	423 (bottles)	253 (bottles).

TABLE NO. VI.

Statement showing the receipt and issue of sera in the Serum Filling Section from the period 1st October 1944 to 31st March 1946.

Serial number and name of sera.	Details of origin.	Receipt.	Issue.	Balance.
1 Anti Anthrax	....	27	128	..
2 Anti Dysentery.. ..	Lister Institute	1,500	1,581	..
	Evans	2,099	2,404	..
	Haffkine Institute	4,715	1,193	..
3 Anti gas gangrene ..	Lister Institute, 4,000 units ..	25	287	..
	Do. 10,000 units ..	200	360	..
	Evans 4,000 units	..	576	..
	Do. 10,000 units	..	12	..
	Burroughs Welcome 4,000 units.	24	1,221	..
	Haffkine Institute 3,000 units in 10 c.c.	500	562	..
	Haffkine Institute, 4,000 units in 4 c.c.	11	258	..
	Haffkine Institute, Polyvalent 15 c.c.	360	336	..
	Haffkine Institute, Polyvalent 10 c.c.	100	1	..
	King Institute, 10,000 units ..	460	460	..
	Parke Davis 10,000	200	126	..
4 Anti Meningococcus ..	Bengal Immunity	300	327	..
	Burroughs Welcome	100	180	..
5 Anti Pneumococcus ..	Lister Institute	100	127	..
6 Anti Scorpion	Do.	693	681	..
	King Institute, 1 c.c.	744	744	..
7 Anti Peritonitis ..	....	..	6	..
8 Anti Streptococcus ..	Lister Institute, Polyvalent ..	207	715	..
	Do. Puerperal ..	107	612	..
	Do. Erysipelas ..	100	263	..
	Evans, Multivalent	4	648	..
	Do. Puerperal	400	1,172	..
	Do. Erysipelas	204	470	..
9 Anti Venene	Central Research Institute, Kasauli.	774	862	..
10 Neo Haemoplastin ..	Parke Davis	5,500	5,037	..
	Evans	5,226	3,687	..
11 Anti Diphtheritic ..	Lister Institute, 2,000 units ..	100	100	..
	Do. T.A.F. ..	100	100	..
	Do. 10,000 units ..	..	137	..
	Haffkine Institute, 1,000 units.	400	842	..
	Haffkine Institute, 10,000 units 5 c.c.	1,209	891	..
	Haffkine Institute, 10,000 units, 10 c.c.	1,453	934	..
	Burroughs Welcome, 2,000 units.	..	13	..
	Burroughs Welcome, 5,000 units.	..	58	..
	Burroughs Welcome, 8,000 units.	424	424	..
	Burroughs Welcome T.A.F. ..	805	965	..
	Do. A.F.T. ..	55	266	..
	Parke Davis, 5,000 units ..	200	111	..
	Do. 8,000 units ..	..	22	..
	Do. 10,000 units ..	300	300	..
	Do. 20,000 units ..	400	400	..
	Evans, 2,000 units	300	100	..
	Do. 6,000 units	2	185	..
	Do. 10,000 units	778	534	..
12 Antitetanus Prophylactic.	Haffkine Institute, 1,000 units.	12,347	24,345	..
	Do. 3,000 units.	125,776	117,841	..
	King Institute, 3,000 units ..	25,375	22,752	..
	Parke Davis 1,000 units ..	14,385	17,704	..
	Haffkine Institute, Curative, 20,000 units.	13,080	11,949	..
	King Institute, 2,000 units ..	4,459	4,388	..
13 Tetanus Toxod	King Institute	936	925	..

TABLE No. VII.

Department of Water Analysis and Algæ Control—1941–46.

PART I.

WATER SAMPLES.

(a) Domestic purposes.

Number and description.	1941–42.	1942–43.	1943–44.	1944–45.	1st October 1945 to 31st March 1946.
1 Complete chemical and bacteriological examination of water samples from protected water-supplies.	1,718	1,640	1,820	2,010	996
2 Partial chemical and bacteriological examination of water samples from protected water-supplies.	837	824	650	716	465
3 Water samples from rural supplies.	72	44	15	23	28
4 Water samples from Civil Defence Authorities.	42	..	..	..	..
5 Water samples from Military (Land, Naval and Air Force).	24	95	180	188	5
6 Water samples from Hydro-Electric Schemes.	11	..	..	..	..
7 Water samples for Fluorides ..	31	28	42	30	21
8 Water samples from investigation sources.	24	6	28	35	4
9 Water samples from water-supply improvements.	..	168	42	86	..
10 Water samples from Indian States.	12	8	8	40	20
11 Water samples for Leptospiral Investigation.	1	..	..	..	..
12 Water samples for suitability for ice manufacture.	..	1	1	4	3
13 Water samples for suitability for aerated waters.	5	4	3	6	..
14 Water samples for drinking purposes —Post-War Reconstruction.	..	..	..	..	20
15 Water samples from Government institutions and private bodies for potability.	..	21	70	65	31
16 Water samples for Vibrio test ..	1,445	1,220	1,566	1,721	810
17 Water samples for Turbidity test ..	1,285	1,232	1,150	1,364	498
18 Field Investigation by the Senior Public Health Assistant.	193	170	150	96	37
Total ..	5,700	5,461	5,725	6,384	2,938

(b) Government Experimental Filter Station, Kilpauk, Madras,

Number and description.	1941–42.	1942–43.	1943–44.	1944–45.	1st October 1945 to 31st March 1946.
1 Complete chemical and bacteriological examination.	1,908	1,787	2,022	2,670	860
2 Chemical examination only ..	426	482	530	1,196	523
3 Bacteriological examination only ..	..	..	223	336	..
4 Examination for H_2S	576	269	285	360	155
5 Examination for Fluorides ..	..	..	84	19	..
6 Samples of water for Turbidity test.	778	943	1,021	1,200	427
7 Samples of water for determination of chlorine dose.	114	144	15	14	5
8 Samples of water for determination of alum dose.	..	..	6	13	..
9 Microscopic examination of Biological growths.	..	..	6	19	9
10 Alum for analysis	..	..	4	3	5
11 Ammonium sulphate for test ..	..	..	1	4	..
12 Bleaching powder for chlorine content.	..	..	..	..	2
Total ..	3,802	3,625	4,107	5,842	1,986

TABLE No. VII—*cont.*

PART I—*cont.*

WATER SAMPLES—*cont.*

(c) *Non-domestic purposes.*

Number and description.	1941-42.	1942-43.	1943-44.	1944-45.	1st October 1945 to 31st March 1946.
1 Water samples for suitability for use in building construction and reinforced concrete.	4	..	..	1	1
2 Water samples for suitability for use in swimming pools.	36	23	12	16	6
3 Water samples for suitability for use in ceramics.	..	..	..	4	..
4 Water samples for suitability for use in Rayon manufacture.	..	..	..	8	..
5 Water samples for suitability for use in diluting arrack.	..	..	..	3	..
6 Water samples for suitability for use in refining sugar.	..	..	..	2	..
7 Water samples for suitability for mosquito breeding.	..	..	..	3	..
8 Water samples for suitability for cooling engines and corrosivity.	..	..	6	3	11
9 Water samples for suitability for tanning leather.	..	..	3	2	..
10 Water samples for suitability for cooking rice.	..	..	1	..	..
11 Water samples for suitability for agricultural and gardening purposes.	..	7	1	..	13
12 Water samples for suitability for dehydration of vegetables and meat.	..	..	9	1	..
13 Water samples for suitability for paper manufacture.	..	..	..	..	3
14 Water samples for suitability for fish life.	3	6	4	2	2
15 Water samples for suitability for boiler feed.	..	8	26	37	10
16 Water samples for suitability for use in silk filature.	..	4	4	..	..
17 Water samples for suitability for laundry use.	..	1	1	..	..
18 Water samples for suitability for washing, bathing and bus-washing.	..	..	..	..	4
19 Water samples for suitability for detection of creosite.	..	1	..	..	..
20 Water samples for suitability for electroplating.	..	..	2	..	..
21 Sewage, Industrial wastes and distillery effluent.	8	25	2	11	12
22 Leakage water from Mettur Dam ..	103	89	37	20	8
23 Distilled water for B.P. test ..	..	..	1	..	2
24 Samples for Pyrogen test, Phenol test and corrosivity.	..	..	6	4	3
25 Samples for suitability for use in fruit canning.	..	..	4	..	..
26 Water samples for chemical gauging of river flow.	..	..	..	13	9
Total ..	154	164	119	130	84

TABLE No. VII—*cont.*

PART I—*cont.*

WATER SAMPLES—*cont.*

(*d*) *Alogological Studies.*

Number and description.	1941–42.	1942–43.	1943–44.	1944–45.	1st October 1945 to 31st March 1946.
1 Microscopic examination of biological growths.	432	497	512	596	240
2 Tests to determine optimum dose of algicides.	64	93	81	115	48
3 Tests for residual copper sulphate and chlorine.	42	58	46	109	27
4 Field test for organic matter ..	56	76	90	72	32
5 Field test for dissolved oxygen ..	74	85	90	128	68
6 Field test for H_2S.	56	60	55	..	..
7 Field test for alkalinity	85	85	74	96	50
8 Field test for odour and taste ..	..	65	74	102	43
9 Field test for turbidity	..	32	23	54	23
10 Field test for pH.	..	..	28	128	68
11 Analysis of lake and tank sediments.	..	..	7	16	5
12 Examination of suspended matter in ærated water.	..	..	..	..	2
Total ..	809	1,051	1,080	1,416	606
Grand total—Table VII, Part I (*a*) to (*d*).	10,465	10,301	11,121	13,772	5,614

PART II.

Miscellaneous.

Number and description.	1941–42.	1942–43.	1943–44.	1944–45.	1st October 1945 to 31st March 1946.
1 Cerebrospinal fluid for chemical examination.	12	23	23	91	29
2 Urine for chemical examination ..	11	6	9	7	4
3 Specimen of urine submitted as drinking water.	..	1	..	..	..
4 Blood for Van den Bergh reaction ..	1	1	..	6	..
5 Blood plasma for specific gravity, pH and adjustment for denaturation tests.	..	22	79	56	17
6 ph-determination, and adjustment of media and milk.	19	1	24	..	225
7 Broth for oxygen content and moisture content.	..	22	1	..	..
8 Sand for analysis	..	..	2	..	..
9 Curative earth for chemical analysis.	..	1	..	..	..
10 Soil for corrosivity test	..	12	..	..	..
11 Pleural effusion, stone in the bladder, Faeces for occult blood, etc.	2	1	..	..	..
12 Chemical analysis of deposits from water and petrol storage tanks, water mains, etc.	4	2	1	..	3
13 Glass ware (bottles and ampoules for neutrality).	196	15	20	..	..
14 Alum, bleaching powder, lime, etc., for chemical analysis.	83	13	15	30	24
15 Samples of agar, sodium chloride, sodium silicate, rectified spirit, glucose, normal saline, lint, etc., for purity test.	..	9	4	2	1
16 Gum saline for sodium chloride content.	..	..	2	..	..
17 Salt from bitterns	..	..	1	..	..
18 Rock, silt, rock dust for (Silicosis) chemical examination.	..	..	2	1	..
19 Mepacrine Hydrochloride for chemical examination and Percain solution for strength.	..	1	..	..	1
20 Boiler scales for chemical examination.	..	5	6	..	..
21 Determination of tryptic value in pancreatic extract.	..	73	..	..	..
22 Filter paper for efficiency	..	3	..	..	..
23 Examination of stains and reagents for microscopical examination.	8	..	..	..	..

TABLE No. VII—*cont.*

PART II—*cont.*

Miscellaneous—cont.

Number and description.	1941–42.	1942–43.	1943–44.	1944–45.	1st October 1945 to 31st March 1946.
24 Rideal walker and special tests for disinfectants.	33	49	181	86	64
25 Bacteriological analysis of milk samples (milk standard works).	..	..	38	347	276
26 Bacteriological analysis of milk samples from military authorities.	..	..	..	3	1
27 Bacteriological analysis of condensed milk and milk powder.	..	1	..	–	1
28 Bacteriological analysis of malted food.	..	1	2	1	–
29 Bacteriological analysis of glucose, peptone and plum fruit.	..	..	9	–	–
30 Bacteriological analysis of aerated waters.	3	2	2	4	2
31 Blood smears for microscopical examination of filarial and malarial parasites.	..	..	..	768	88
32 Identification of snakes, mosquitoes, sandflies, maggots, midges, etc.	266	199	251	2	1
33 Chick membranes for accurate weighing (112 indents).	604	..	..	..	..
34 Supply of B. coli strain to the Madras University Botany Laboratory.	..	..	..	..	1
35 Vegetable oil blends and individual oil samples for larvicidal properties.	..	..	24	35	72
36 Spread aiders and film stabilisers (estrified oil).	..	..	6	6	4
37 Purity and identity tests for protein hydrolysate.	..	..	..	..	6
38 Assay of pepain	..	..	..	..	3
Total ..	1,242	463	696	1,445	823

PART III.

Supplies of Solutions.

1 Fifty per cent glycerine.	9 litres.	..	..	..	..
2 Buffered distilled water.	9 Do.	..	10 l.	1·5 l.	6 l.
3 Coal tar ointment ..	3 lb.	..	..	..	..
4 Solution for strongyloids.	2 l.	2 l.	..	..	..
5 Eupad powder	3 lb.	..	..	..	..
6 Formol saline	2 l.	..	..	..	..
7 Formaline solution ..	1 l.	..	..	..	..
8 Tyrode solution ..	20 l.	3 l.	8 l.	1 l.	250 c.c.
9 Pancreatic extract ..	143·31 l.	365 l.	240·33 l.	237·62 l.	113·600 l.
10 Purified carbolic acid	66 lb.	..	60 lb.	..	..
11 Borate buffer solution.	..	6 l.	..	..	..
12 Leucker's fluid	..	28·5 c.c.	..	..	..
13 Sodium hydroxide (normal).	..	500 c.c.	..	..	..
14 Sodium carbonate (decinormal).	..	2 l.	..	..	..
15 Sodium carbonate (in 20,000).	..	1 l.	..	..	..
16 Buffered solution (pH 7·0).	..	2·11 l.	..	..	..
17 Mercuric chloride (1 in 10,000).	..	500 c.c.	..	..	..
18 Potassium oxalate in tubes of 0·2 grams.	..	12 tubes.	..	300	80
19 Diazo reagent A and B.	..	200 c.c.	..	..	..
20 Silver nitrate decinormal).	..	513 c.c.	912 c.c.	114 c.c.	170 c.c.
21 Sanchi's reagent for estimation of fluorides.	..	..	8 oz.	..	..
22 Pottassium chromateo per cent.	..	..	..	114 c.c.	114 c.c.
23 Phenol red solution 0·01 per cent.	..	..	..	500 c.c.	..
24 Standard soap solution.	..	..	..	500 c.c.	..
25 Protein hydrolysate ..	..	..	..	..	2 l.

TABLE No. VIII.

Protected water-supplies examined at the King Institute with details regarding source, method of filtration, chlorination, etc.

Protected water supplies.	Total.	Source.				Infiltration gallery and well.	
		Impounded reservoir.	River or stream.	Tank.	Well.	On bed of river.	On bank of river.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Municipalities	50	4	13	1	5	20	7
Panchayat boards ..	16	..	2	2	9	1	2
Jail, Borstal and Certified schools	21	..	1	..	11	3	6
Railway stations ..	49	1	3	..	39	6	..
Swimming pools ..	4	4	..	..	..	..	..
Other institutions ..	7	..	3	1	2	1	..
Cochin State	2	..	1	1	..	..	..
Total ..	149	9	23	5	66	31	15

Protected water-supplies.	Filtration.				Not filtered.	Chlorination.		
	Slow-sand filter.	Mechanical pressure filter.	Mechanical gravity filter.	Infiltration gallery and well.		Automatic liquid chlorine.	Hand controlled bleaching powder.	Unchlorinated.
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Municipalities	6	3	3	27	11	9	28	13
Panchayat Boards ..	1	..	..	3	12	..	9	7
Jail, Borstal and Certified Schools	..	..	..	9	12	3	13	5
Railway stations ..	..	..	1	6	42	20	14	15
Swimming pools ..	..	1	..	..	3	..	2	2
Other institutions ..	..	1	2	1	3	2	3	2
Cochin State	..	1	1	..	..	1	..	1
Total ..	7	6	7	46	83	35	69	45

TABLE No. IX-A.

Showing the quantities of plasma, whole blood and red cell suspension supplied.

	1941.	1942.	1943.	1944.	1945.	1946.
Plasma prepared in c.c. ..	10,150	225,885	229,450	219,300	114,850	152,050
Plasma issued in c.c. ..	5,260	56,600	176,050	223,675	313,190	118,400
Whole blood issued ..	1,050	2,300	3,600	7,550	13,075	6,470
Red cell suspension ..	6,500	55,250	84,950	80,575	44,225	13,400

TABLE No. IX-B.

Transfusions up to the end of September 1946.

Year.	Whole blood.	Plasma.	Reconstituted blood.	Total.
1942	..	21	4	25
1943	2	85	80	167
1944	4	112	74	190
1945	43	101	43	187
1946	121	22	25	168
Total ..	170	341	226	737

TABLE No. IX-C.

Showing the visits of the mobile team and number of donations.

Place of visit.	1941.		1942.		1943.		1944.		1945.		1946 end of September.	
	V.	D.	V.	D.	V.	D.	V.	D.	V.	D.	V.	D.
Government General Hospital, Madras	16	25	176	1,208	191	667	138	513	148	293	99	62
Centres in Madras City	26	65	62	472	40	595	64	572	18	207	11	95
Centres outside Madras City ..	..	..	6	116	19	340	17	705	10	498	8	290
Total ..	42	90	244	1,796	250	1,702	219	1,790	176	998	118	447

V = Visits. D = Donations.

TABLE No. IX-D.

Statement showing the number of donors who donated blood to the Madras Blood Bank.

Sources.	1941.	1942.	1943.	1944.	1945.	1946 (till September).
A.R.P.	..	399	491	133	1	Nil.
Police	..	407	553	540	308	19
Jails	46	84	203	504	434	359
Teachers and students ..	38	117	158	318	61	8
Firms	2	165	122	163	2	1
Military	Nil.	275	5	8	55	15
Unattached	4	349	170	124	137	49
Total ..	90	1,796	1,702	1,790	998	451

Grand total .. 6,827

TABLE No. IX-E.

Table showing the distribution of donors among the various communities.

	Men.	Per cent.	Women.	Per cent.
British	328	5·7	136	41·4
Indian Christian ..	518	8·9	81	24·6
Anglo-Indians ..	155	2·7	49	14·9
Hindus	4,297	74·3	58	17·6
Others	488	8·4	5	1·5

TABLE No. IX-F.

Table showing issue of blood grouping sera during 1941–46.

April 1941 up to September 1946.

	C.C. 1941.	C.C. 1942.	C.C. 1943.	C.C. 1944.	C.C. 1945.	C.C. 1946.
A	19	75	59	123	186·25	274·5
B ..	19	75	59	121	186·25	274·5
C	..	13	31	76	112·25	160

REPORT OF THE GOVERNMENT ANALYST, MADRAS, FOR THE PERIOD 1ST OCTOBER 1944 TO 31ST MARCH 1946

(SUPPLEMENT TO THE REPORT OF THE KING INSTITUTE, GUINDY.)

(Called for by G.Os. No. 142, P.H., dated 22nd January 1930, Ms. No. 2516, P.H., dated 8th October 1930, and No. 2129, P.H., dated 17th July 1946.)

[By K. V. Sundaram Ayyar, M.SC., F.R.I.C., *Government Analyst, Madras.*]

The last Annual Report issued by the Government Analyst, Madras, was for the year 1st October 1940 to 30th September 1941, covering the second year of War. Owing to stringent war conditions it was not found possible to issue the Reports for 1942, 1943 and 1944. The present Report covers the period of eighteen months from 1st October 1944 to 31st March 1946, giving effect to a Government Order and the Annual Reports in future will cover the official year from April to March. A condensed account of the number of local bodies where the Act was in force, the number of samples taken and found adultered together with other salient features for the three years 1942 to 1944 are also included.

The work of the Government Analyst's laboratory is mainly concerned with the analysis of foods taken under the Madras Prevention of Adulteration Act from all over the Province, except the city of Madras which has its own laboratory and Public Analyst, who was initially trained in my laboratory. The Act has been extended practically to all places throughout the Province which have a population of 10,000 and over. The local bodies, municipalities and panchayat boards, are divided into three classes of municipalities and panchayat areas. Class A municipalities are allowed to send every month 12 samples for an annual contribution of Rs. 720; B class municipalities 8 samples for an annual contribution of Rs. 480 and C class municipalities and panchayats 4 samples for an annual contribution of Rs. 240.

Besides the contribution for the cost of the analysis of the samples, Government take 10 per cent of all fines realized in food adulteration cases and the excess in fines over the contribution to Government is shared equally between Government and the local bodies. In the case of fines realized in non-analysis cases, e.g., for exposure of food to dust and flies or for storage of food in improperly tinned vessels, preventing the Inspector from taking samples, interfering with seized articles, etc., the whole of the fines realized, except for 10 per cent retained by Government, is credited to the local bodies. The result is that local bodies invariably realize, by way of their share of fines, more than their contribution to Government. Thus the working of the Act costs no extra expenditure either to Government or to the local bodies.

Finance.

A financial statement showing the estimated receipts and expenditure of my Department for the year 1942–46 is given in Table No. IX. The net profit for the year ending 30th September 1941 was Rs. 20,188. During the 4½ years under report this has increased year by year as shown below:—

	RS.		RS.
1941–42	23,713	1943–44	85,941
1942–43	52,897	1944–46	1,33,379

This increase is due to (1) contribution from new areas, (2) fees for extra samples, (3) income from miscellaneous samples and (4) increased revenue resulting from the apportionment of fines.

Samples.

In the period under report, the Act has been extended to 32 panchayats bringing the local bodies working the Act to a total of 225. The total number

of samples taken under the Act during this period is 26,597, including 8,235 analysed in Madras City by its own Analyst. Besides, 2,772 samples from Government hospitals, jails, railways, private bodies and referee samples from magistrates have been received and analysed. The number of samples received and analysed in each of the years 1942–46 are as under:—

Year.	Samples under the Act. Madras City.	Municipalities and panchayat.	Total.	Other miscellaneous samples.	Total.
1941–42	1,709	10,087	11,796	722	12,518
1942–43	1,999	11,405	13,402	1,140	14,542
1943–44	2,012	13,120	15,132	1,173	16,305
1944–46	3,235	23,362	26,597	2,772	28,369

Full details about "Miscellaneous samples" are given later.

The quota of samples allowed to local bodies is very limited and a number of them, particularly the larger municipalities have increased their quota of samples. These are given in the Appendix. A number of local bodies have also been permitted to send extra samples and are charged at Rs. 5 for each sample. The number of extra samples sent by each of the local bodies during each of the years 1942–46 are given in Table No. IV. The total extra samples taken each year are—

1941–42	483	1943–44	444
1942–43	311	1944–46	966

Particulars of the total number of samples taken and the total adulterated in each local body during the three years 1942–44 are given in Table No. V. Full details of the number and nature of samples taken, the proportion adulterated, etc., in each local body during the eighteen months (1st October 1944 to 31st March 1946) under report are given in Tables Nos. VI-A, VI-B and VI-C. Generally almost all local bodies have sent full quotas, but in a few municipalities and panchayats, due to outbreak of severe epidemics such as, plague and cholera, sampling had to be suspended for short periods for the reason that either the population had been evacuated or the Sanitary Inspectors were fully engaged in combating the epidemics, without a substitute to attend to sampling work.

In some panchayats dislocation of sampling was also caused by the temporary absence on leave or otherwise of the Sanitary or Health Inspector without a substitute. Government have now authorized District Health Officers to delegate powers to Executive Officers of panchayat boards (under section 16 of the Public Health Act) so that they can attend to the sampling work without interruption when the sampling inspector is not available.

Summarized particulars of the total number of samples taken, in the Province, total adulterated and the percentage adulterated during the period under report are given below:—

TABLE No. I.

	1944–46. Total number of samples.	Total adulterated.	Percentage adulterated.
Municipal towns—			
Madras City	3,235	1,113	31·4
28 Municipalities, Class A ..	9,424	4,599	48·8
21 Do. Class B ..	2,901	1,400	48·4
34 Do. Class C ..	2,700	1,273	47·1
Rural areas—			
141 Panchayat Boards, Class C ..	8,337	3,751	45·0
Total for 225 local bodies ..	26,597	12,136	45·7

Figures for the years 1942–44 are given in Table No. III.

Table No. II compares the total number of samples taken in the Province during the 18 months under report with that of the previous year, of the important staple articles of food, the number adulterated and the percentage adulterated.

TABLE No. II.

Nature of article.	1944–46.			1943–44.		
	Total.	Adulterated.	Percentage adulterated.	Total.	Adulterated.	Percentage adulterated.
Ghee	3,157	583	18·5	2,563	490	19·1
Milk	17,002	10,565	62·4	7,755	5,062	65·2
Butter	655	141	21·5	481	137	28·4
Gingelly oil ..	3,473	596	17·2	2,534	384	15·1
Other samples ..	2,310	351	15·2	1,799	267	14·8
Grand total ..	26,597	12,136	45·7	15,132	6,340	41·0

Table No. II-B gives the same information for the previous two years 1941–42 and 1943–44.

TABLE No. II-B.

Nature of article.	1941–42.			1942–43.		
	Total.	Adulterated.	Percentage adulterated.	Total.	Adulterated.	Percentage adulterated.
Ghee	2,399	526	21·9	2,360	568	24·0
Milk	5,747	3,099	54·0	6,673	4,069	61·0
Butter	388	99	25·5	374	83	22·1
Gingelly oil ..	2,086	254	12·2	2,035	225	11·1
Other samples ..	1,176	226	19·2	1,960	435	22·1
Grand total ..	11,796	4,264	36·1	13,402	5,380	40·0

The above tables include samples analysed in Madras City.

A study of Tables Nos. VI-A, VI-B and VI-C will reveal that adulteration in the Province is very high, particularly in the areas to which the Act has been newly extended, e.g., Bhavani 76·9 per cent; Kallakurichi 81·8 per cent; Kallidaikurichi 75 per cent; Madurantakam 78·5 per cent; Namakkal 70·4 per cent; Ranipet 74;1 per cent; Vriddhachalam 85;3 per cent; Yellamanchili 77 per cent.

Milk.—Of 17,002 samples of milk analysed 10,565, i.e., 62·4 per cent were found to be adulterated. It must be admitted that the Act, as at present administered has failed to prevent the adulteration of this most essential of all articles of food. The question naturally arises whether this adulteration can be prevented and if so what steps should be taken to stop it. I think this can and must be prevented, though it should be realized that the task is beset with many difficulties. The number of petty milk vendors is very large. The interval between milking and sale is very short. The adulterant (water) can be had anywhere and it costs nothing. The vendors have, for generations, practised this traffic in watered milk and unless some drastic steps are taken they would not mend their ways. There appears to be no public opinion to resent and remedy this fraud which is practised on them. In my opinion, every milk vendor or organization selling milk should be compelled to take out a licence and the power to issue and cancel such licences should vest with the local bodies, who should strictly enforce the conditions in the licence. The fine meted out for adulteration should be exemplary both as a punishment for the fraud and as a deterrent for the future. Those who are selling adulterated milk

repeatedly should be prevented from trading altogether. Small producers should be required to sell only to approved central milk distribution centres or organize themselves into co-operative societies for the sale of milk. Government and local bodies should start model dairies. The record of the small number of co-operative societies selling milk is not satisfactory, as their supply of milk to the public and hospitals has been found repeatedly adulterated. They should be sampled and prosecuted as any other vendor. In England the wholesale co-operative societies and even Government Distributing Board of Milk are not immune from being proceeded against if the milk distributed by them is found adulterated. Wide publicity of the offenders should be given by publication in local dailies and municipal gazettes. In England most of the milk and other food adulteration cases are reported in the monthly *British Food Journal* entirely devoted to this purpose. More food analysis laboratories should be established at other places instead of sending all the samples practically to one laboratory at Madras, which entails delay and complication in analysis.

Ghee.—Of 3,157 samples taken 583 were adulterated. The adulterant is hardened vegetable fat commercially known under the trade name of Marvo, Vanaspathi, etc. A large number of factories have sprung up all over India. In the early years of its manufacture it was not sold as such in this Province to the public, but found its way into butter and ghee as adulterant by reason of its being devoid of odour and taste and its similarity in appearance to ghee and the difficulty of its detection by the ordinary purchaser. The action taken under the Act has considerably checked its use as an adulterant, and it is now being offered to the public for sale under its distinctive name.

Butter.—Of 655 samples received 141 were found adulterated, mostly with water and some with foreign fat, which is usually incorporated in the milk before churning. There is an erroneous impression among many consumers that butter is not capable of being adulterated with foreign fat.

Edible oils.—Of 4,291 samples comprising gingelly oil, coconut oil, safflower oil and niger seed oil, 696 were adulterated. The chief adulterant continues to be groundnut oil. Adulteration of coconut oil has greatly increased, due no doubt to a sharp rise in its price this year.

Coffee and tea.—Tea adulteration in this Province has practically ceased although in previous years it was largely adulterated with foreign leaves and husks processed to resemble tea in leaf or dust form. Coffee powder is still largely mixed with roasted cereals, legumes and nuts. Of 684 coffee powder samples 44 were found adulterated. A number of coffee seeds were color polished with dyes in order to impart to inferior quality seeds a better appearance.

Turmeric.—Of 171 samples 52 contained lead over 5 parts per million, the limit allowed by Government. The maximum amount of lead found was 240 parts per million. Turmeric is used as a spice in food and a component of curry powder. Natural turmeric is free from lead. To give brighter color and conceal inferiority, the " fingers " are dyed with a lemon colored mineral pigment of lead known as " Rama " in the local markets. The practice of mixing this pigment with an edible substance constitutes a serious danger to public health as lead compounds are " cumulative poison ", i.e., repeated ingestion of doses of lead each of which is too small to produce any appreciable effect on health, may, in course of time, reach a concentration sufficient to produce serious symptoms of poisoning.

Bengalgram flour.—Complaints were received especially from the Andhra districts that Bengalgram flour (Cicer Arietinum) was being adulterated with redgram flour (Cajanus Indicus). A suitable method has been worked out for its identification and estimation. The redgram has a constant proportion of grain split at the hilum which is very characteristic and the microscopical counting technique of Wallis has been adopted for its estimation. The suspected powder is mixed with a known weight of lycopodium powder and the ratio of the number of split starch grains to lycopodium spores is compared with standard mixtures containing known amounts of redgram flour.

Miscellaneous samples.

The following table shows the number of miscellaneous samples received from Government hospitals and institutions, jails, railways, referee samples from magistrates and private bodies during the 4½ years :—

	1941–42.	1942–43.	1943–44.	1944–46.
Government hospitals, jails and other institution	592	995	892	1,737
Referee samples from magistrates	5	29	42	26
Railways	36	..	117	859
Private bodies	89	116	122	150
Total ..	722	1,140	1,173	2,772

Hospitals, jails and other Government institutions.—One thousand seven hundred and twelve food samples and 25 drugs were received. Bread, milk and butter, as usual, formed the major part of the articles received. Some samples of butter contained a large amount of excess water, as much as 50 per cent. Such supplies could be rejected on the spot. District Medical Officers were instructed to adopt the following method for its detection :—

" Gross excess of water in butter can easily be detected. Place a little of the butter in a test tube and keep it melted for sometime in a bath of warm—not boiling-water. The butter separates out in a short time into two layers and the water layer should not exceed one-fifth of the total. This, of course, is not an exact method but any serious adulteration is obvious."

This will enable rejecting immediately supplies of butter with such a gross excess of water.

Drugs.—Twenty-five drugs and dispensed medicines were examined to find out whether the mixtures are correctly dispensed as per prescriptions or the drugs conform to the standards prescribed in the British Pharmacopœa. There has been a fall in the number of samples of mixtures and drugs received and it should not be too strongly emphasized that the need for inspection and testing of drugs and mixtures is as great as before. Medicines are still scarce and costly and there is no legislative control to prevent adulteration of drugs, or sale of drugs and incorrectly dispensed mixtures.

Referee samples.—The number of referee samples received from magistrates, at the instance of the accused, in Food adulteration cases, have increased year by year. Of 26 samples received, 24 agreed with the original analysis and two were found to be genuine.

During the war, under the Defence of India Rules, Government had prohibited the export of tapioca from Malabar. In 1943 samples of flours labelled as palm tree starch, but suspected to contain tapioca were seized by the Police in that district and sent to me for examination. They were found to be tapioca. The entire stock was forfeited to the Government and heavy fines were imposed on the exporters. In G.O. No. 3266, Home, dated 13th December 1943, Government appointed the Government Analyst as ex-officio Chemical Examiner to Government, to obviate the personal appearance in court in cases which do not come under the Prevention of Adulteration Act.

Railways.—Since 1942 both the M. & S.M. and S.I. Railways have been sending samples of foods, chiefly ghee and gingelly oil, for testing their purity. Consequent on the sharp rise in the price of essential commodities, these Railway administrations have opened grain shops for distribution of foodgrains, etc., to their employees at cheap prices. Of 859 samples received 13 were found adulterated. In 1945, the M. & S.M. Railway established their own food laboratory and one of my assistants was selected for the post of the Food Analyst.

Private bodies.—A number of commercial firms have sent groundnut oil samples, taken from large consignments intended for export, for certification stating the acidity, moisture, etc. Such a certificate is required by importers.

Oil cakes from a number of firms have also been analysed for nitrogen and oil content. A number of merchants in the Province sent samples to satisfy themselves that the articles they purchased are up to the standard of purity required by the Act. It shows that the Act has effected an improvement and merchants have realized the need, as required by the Act, to exercise due diligence in purchasing and selling only pure articles of food. It behoves the general public to encourage such honest merchants by purchasing their requirements from these merchants.

Five samples of curry powder on behalf of the Government of Ceylon and two samples of petrol from the Nizam's Government were also examined.

Fumigation.—In 1943, in connexion with rationing, a large supply of wheat arrived in Madras. This supply was slightly damaged and the Entomologist, Agricultural College, Coimbatore, was of the opinion that unless the damage is arrested immediately the supply would be unsuitable for human consumption. At the instance of the Commissioner of Civil Supplies a Committee consisting of the Government Analyst, Director, King Institute, Director of Public Health, the Government Entomologist and the Superintending Engineer, Public Works Department, went into the question and decided to start fumigation under strict supervision and control. The experiment was successful and a special staff has been appointed in four different parts of this Province to carry out fumigation. Thousands of bags of imported wheat and other cereals, etc., have been fumigated without any accident. The stock, after fumigation is released to the public only after being certified by me to be free from any residual hydrocyanic acid. It is necessary to utter a warning that fumigation should be restricted only to cases where the damage has just commenced and in the unavoidable circumstances when proper control and storage of the cereals are not possible at the source. There should be no need, if early and proper precautions are taken, for cereals produced in this country to be fumigated.

Fines.

Table No. VII gives the number of convictions, average fine, fines in analysis and non-analysis cases and the total fines levied in each local body during the three years 1942–44. Table No. VIII gives more detailed information about the fines for the 18 months 1944–46 under report, in respect of each local body giving also the maximum and minimum fines imposed. The average fine in food adulteration cases in the whole of the Province during each of the 4½ years is—

	RS.		RS.
1941–42	29	1943–44	47
1942–43	40	1944–46	49

From this it is evident that there is an upward trend, but this is more apparent than real. The fines imposed, except in respect of a few cases do not reach the maximum, which is Rs. 100 for the first offence and Rs. 500 for the subsequent offence. It should be borne in mind that these scales of fines were fixed in 1918 and have not been revised. Prices of foods have increased three or fourfold, as will be seen by a comparison of the pre-war prices with those obtaining today of some of the important staple articles of food—

Pre-war price.		Present price.
Milk	6 annas per measure (three measures a rupee) ..	Rs. 1–8–0 per measure.
Ghee	Rs. 2–8–0 per viss	Rs. 8–0–0 per viss.
Gingelly oil	Re. 0–8–0 do.	Rs. 2–8–0 do.
Groundnut oil	Re. 0–5–0 do.	Rs. 1–9–0 do.

and the highest average fine of Rs. 49 in 1944–46 would be equal to a pre-war amount of Rs. 10–12. Adulteration can be put down only if, in the majority of cases where it is detected, maximum fines are imposed. Government have repeatedly called the attention of the magistrates to the desirability of imposing heavier fines. The trivial fines can easily be made out of the illegal gains obtained in the course of a week or two of fraudulent trading in adulterated

foods. Magistrates should view food adulteration as something quite different from technical breaches of law. They are not nuisance cases but deliberate fraud, robbing the people, often children and invalids not only of their money but also of their nourishment to health.

Food articles exposed to flies and dust.—Only 79 local bodies took advantage of Part III of the Rules (Rules 5–8) which make it an offence to sell food exposed to dust, dirt and filth, or keeping them in improperly tinned vessels rendering them unfit for consumption. In Madras City not even a single prosecution was launched under these rules and it cannot be said that sale of such foodstuffs has ceased in this city. These rules should be more fully enforced. The exposure for sale of cooked and uncooked foods, not properly covered, by the roadside and in hotels constitutes a menace to public health. Unfortunately the public, literate as well as illiterate, do not realize that purchase of such foods is fraught with danger, is a reflection on their lack of civic conscience and an encouragement to the vendors to persist in an unhealthy and illegal act.

A number of convictions have been obtained in as many as 95 local bodies for—

(*a*) obstructing the sampling inspector from inspecting shop, etc.,—Section 8,

(*b*) interfering with seized stocks, etc.—Section 10,

(*c*) preventing the inspector from taking samples—Section 14 (3).

However, the fines for such offences have been meagre, mostly from Rs. 10 to Rs. 20, with the result that offences under this heading have registered an increase. Very heavy penalties are required for such offences since the vendors know that their stocks are adulterated and have resorted to such methods as preventing samples being taken, etc., hoping to escape with light penalties—as have happened—since the percentage of adulteration could not be proved.

Amendments to rules.

A number of new rules and amendments to the existing ones have been made with a view to remedy existing defects or as the result of court interpretations which showed the weakness of certain rules. They are issued in the Government Orders quoted hereunder:—

Milk—Rule 27, G.O. No. 2107, P.H., dated 1st September 1943.
Oil—Rule 27-A, G.O. No. 1800, P.H., dated 12th June 1942.
Ghee—Rule 25-A, G.O. No. 3823, P.H., dated 11th December 1942.
Ghee—Rule 28, G.O. No. 1567, P.H., dated 25th May 1942.
Sweets—Rule 28-B, G.O.. No. 3097, P.H., dated 30th November 1945.
Coffee—Rule 36, G.O. No 2987, P.H., dated 22nd November 1943.
Coffee—Rule 36, G.O. No. 258, P.H., dated 29th January 1944.

Formerly the sale, offer or exposure for sale of these adulterated articles was an offence. In a number of cases, though it was proved that the accused were habitual vendors, still the magistrate acquitted them on the ground that actual sale was not proved. Under section 5 (2) of the Act, magistrates may presume that " any food found in the possession of a person who is in the habit of manufacturing or storing like articles for sale has been manufactured or *stored* by such person for sale." These rules have now been amended and " possession of adulterated foods, cited above, for the purpose of sale " is an offence.

Originally the coffee rules applied to the sale of coffee powder, tablets, etc. Owing to the non-availability of chicory during the war hotel-keepers began to use various adulterants in preparing coffee decoction; further, they stored the adulterant separately and mixed them along with pure coffee powder only at the time of preparing the decoction. To prohibit such malpractices the coffee rule (No. 36) had to be amended twice. It is now an offence to sell or have, for the purpose of making coffee decoction, mixtures containing coffee with substances other than chicory.

The sale of oil mixtures containing gingelly oil, under whatever designation, is made an offence under the amended rule 27-A, as the previous rule prohibiting adulteration of other oils with gingelly oil was interpreted by some magistrates that it would not cover cases when a mixture containing groundnut oil and gingelly oil is sold as groundnut oil, etc.

High Court Rulings.

Most of the contested cases have been on points of law. Summaries of the important judgments likely to further the working of the Act are given below:—

(1) *Criminal Revision Case No.* 368 *of* 1941.—Detection of adulteration in milk by the "Freezing Point Test":—A vendor of milk was convicted for selling milk adulterated with water. His contention on appeal was that inasmuch as the milk supplied by him was up to the standard of purity prescribed under the Act by Government he had not committed any offence. He also contested the particular method adopted by the Public Analyst to detect the presence of added water. The magistrate convicted the accused and on appeal to the High Court the latter upheld the lower Court's judgment observing that the standards laid down are only presumptive standards, that—

* * * * *

"Under rule 27 it is a punishable offence to add water, whatever the resulting fat, non-fat solids, and nitrogen content of the milk might be"

and the presence of added water was conclusively proved by the "Freezing Point Test" adopted by the Analyst. Quoting an authority, His Lordship observed—

"There seems to be little doubt that the Freezing Point method is the most certain which we have for the determination of added water in milk."

(2) *Criminal Revision Case No.* 163 *of* 1942.—Non-observance of the strict technicalities of the Act is no bar to proceedings:—In another case, the magistrate acquitted a vendor accepting the defence plea that, as required by the Act, the Inspector did not give a notice in writing of his intention to have the sample analysed. In the course of his judgment His Lordship observed—

"If the accused commits an offence under section 5 by offering adulterated ghee for sale, it does not cease to become an offence because of an omission on the part of the Sanitary Inspector to comply with the requirements of section 15 in giving a notice in writing that he had taken the ghee for the purpose of analysis. Section 15 seems to have been enacted for the protection of the vendor so that he himself might, if he so wished, have the ghee analysed privately so that he might be satisfied that it was really adulterated in the manner and to the extent indicated by the Public Analyst.

Section 15 does not suggest that it is in any way connected with the prosecution or the trial so as to make it an indispensable preliminary to either."

(3) *Criminal Revision Case No.* 333 *of* 1944.—A wholesale merchant's coffee tablets was found to contain coffee, coffee husk and another roasted cereal. He was convicted with a fine of Rs. 500 (maximum fine). The destruction of the adulterated stuff which had been seized was also ordered. Against this judgment for the destruction of the stock, he appealed to the High Court who, by a Full Bench, upheld the lower Court's order stating—

"That the goods seized were adulterated within the meaning of the Act is quite clear and the order for the destruction is not only a lawful one but is a very proper one."

(4) *Criminal Appeal No.* 85 *of* 1945.—When a warranty is pleaded it should be in the prescribed form:—A magistrate acquitted a vendor who sold as coffee tablets a mixture containing roasted cereals with 15 per cent coffee on the ground that he sold it in the same condition in which he received it and accepted as warranty the cash bill from the wholesaler. The High Court reversed the judgment and convicted the accused holding—

"This contention obviously cannot be accepted as the warranty referred to in section 6 (2) (*a*) (i) is by the terms of the section itself 'a wri§tten warranty in the prescribed form.' A label or cash bill of course is not a written warranty in the prescribed form."

(5) *Criminal Appeal No.* 632 *of* 1943.—Purchase of a sample by a Sanitary Inspector held to be a "sale":—In Criminal Appeal No. 632 of 1943 the learned High Court Judge decided that when a sample is purchased by the Inspector in the ordinary way, it is a sale.

(6) *Criminal Appeal No.* 392 *of* 1944.—Conviction of minors and recovery of the fine from the parent or guardian under Children's Act:—This High Court judgment will be of great assistance to officers working the Act in dealing with the practice that has arisen lately of making minors to sell and deliver adulterated milk, etc. The High Court convicted the child and ordered the parent to pay the fine under section 26 (1) of the Madras Children's Act. When it is intended to invoke this section, the parent or guardian of the child must be summoned to the Court at the time of the hearing.

It was also held that delegation of powers under the Prevention of Adulteration Act made before the passing of the Public Health Act is still valid unless revoked.

(7) *Criminal Appeal No.* 405 *of* 1945.—Sale of adulterated articles even under a contract is an offence under the Act:—A milk vendor was convicted by the Sub-Magistrate, Tiruvannamalai, but the Subdivisional Magistrate acquitted her on the ground that the accused was not liable under rule 27 for the sale of adulterated milk since she supplied adulterated milk to a hotel *on agreement*. Government preferred an appeal to the High Court, who set aside the order of acquittal passed by the Subdivisional Magistrate. The following is the relevant portion of the Hon'ble Justice's ruling:—

"It may be that the hotel-keepers were not keen on the quality of milk supplied to them when there was so much scarcity of milk on the one hand and demand on the other but it does not confer any immunity on milkmen or milkmaids and authorize them to adulterate the stuff."

General.

If adulteration is to be put down effectively and completely, as in other countries, the Act should be enforced in such a way that the chance of a vendor being sampled is not infrequent; but, with limited quotas allowed for the local bodies the position is not likely to improve. A six to tenfold increase in the number of samples would be necessary, but such a large number of samples could be dealt with only if more food analytical laboratories are established. For example, in England which has almost the same population as the Madras Province almost every county and in the United States of America, every one of the 48 states has its own food laboratory for the analysis and control of food. The samples usually analysed are of the order of 200,000—nearly 10 times the number analysed in the Madras Province, with a result that adulteration has practically ceased. In Egypt, which has a population of about a third of this Province, the number of foods analysed in a year, as revealed in the latest report received, was over 100,000 and the average per cent of adulterated foodstuffs was under 8 per cent.

Proposed New Act.

An Amending Act to the present Act was proposed in 1940. In 1941 Government framed a new Bill to replace the present Act, more general and wider in scope and was published in 1945 for criticism. Its passing into law is long overdue as new rules and many amendments considered necessary for the proper and efficient prevention of food adulteration have been proposed to be incorporated in the new Bill.

Staff.

The technical staff of the Government Analyst Department on March 1946 consisted of—

One Government Analyst,
One Additional Government Analyst,
Two Senior Assistants to Government Analyst, and
Nine Junior Assistants to Government Analyst.

There were also one laboratory Technical Assistant, three first-grade attendants, two second-grade attendants and seven peons. In addition to the technical staff, the establishment included one steno-typist, two typists and two clerks.

Mr. Herbert Hawley, O.B.E., M.SC., F.R.I.C., after 22 years of service as Government Analyst, retired on 31st March 1946. When he formed the department in 1924, the Food Adulteration Act of 1918 was not functioning. The credit of putting the Act in a form that would suit modern requirements of food control and creating and organizing the machinery to carry out the work for the proper carrying out of the Act is largely due to him. With 45·7 as the percentage of food articles sold adulterated, much strenuous work still lies ahead.

The Additional Government Analyst (now the Government Analyst) was deputed by Government to England and America for six months to make a tour of food laboratories in these countries. In England, America and other countries, wherever he went, he was shown utmost courtesy and given all help and guidance. To one and all of them, to the President of the Royal Institute of Chemistry, and the officials of the Government of India in London and Washington, who arranged his tour and obtained necessary facilities for work, he tenders his grateful thanks.

THE KING INSTITUTE, GUINDY, 12*th December* 1946.

K. V. SUNDARAM AYYAR, M.SC., F.R.I.C., *Government Analyst.*

TABLE NO. III.

Particulars of the total number of samples taken in the Province, total adulterated and the percentage adulterated during the years 1942–1944.

	Total number of samples.	Total adulterated.	Percentage adulterated.
1941–42.			
Municipal towns—			
Madras City	1,709	402	23·5
Municipalities—			
Class A 22	4,554	1,681	36·9
Class B 14	1,347	526	39·1
Class C 44	2,163	925	42·9
Rural areas—			
Panchayats—			
Class C 51	2,023	730	36·2
Total for 132 local bodies ..	11,796	4,264	36·1
1942–43.			
Municipal towns—			
Madras City	1,999	456	22·7
Municipalities—			
Class A 24	4,816	2,119	43·7
Class B 14	1,370	603	44·0
Class C 45	2,338	1,042	44·6
Rural areas—			
Panchayats—			
Class C 83	2,849	1,160	40·5
Total for 167 local bodies ..	13,402	5,380	40·0
1943–44.			
Municipal towns—			
Madras City	2,012	364	18·1
Municipalities—			
Class A 24	5,134	2,304	44·0
Class B 14	1,342	606	45·1
Class C 45	2,386	1,140	48·0
Rural areas—			
Panchayats—			
Class C 109	4,258	1,926	45·2
Total for 193 local bodies ..	15,132	6,340	41·9

TABLE No. IV.

Statement showing the number of extra samples sent by local bodies during the years 1942–1946.

Name of local body.	Year ending 30th September 1942.	Year ending 30th September 1943.	Year ending 30th September 1944.	Years (1st October 1944 to 31st March 1946).
		MUNICIPALITIES.		
1 Madura	..	..	..	4
2 Bezwada	1	..	..	..
3 Trichinopoly	166	..	..	..
4 Calicut	7	9	20	7
5 Coimbatore	37	35	28	16
6 Cocanada	3	6	..	..
7 Guntur	12	..	..	..
8 Vizagapatam	5	1	..	..
9 Ootacamund	34	32	34	23
10 Rajahmundry	2	21	15	..
11 Mangalore	..	..	..	221
12 Tanjore	2	14	62	35
13 Tinnevelly	28	7	12	..
14 Anakapalle	..	9	12	1
15 Bellary	..	14	1	9
16 Conjeeveram	..	21	53	73
17 Coonoor	8	2	4	..
18 Cuddalore	..	1	..	..
19 Ellore	..	1	..	..
20 Kumbakonam	42	..	5	42
21 Masulipatam	..	..	..	1
22 Negapatam	..	..	12	16
23 Palghat	..	..	..	4
24 Tuticorin	2	1	2	..
25 Vellore	13	9	2	10
26 Pollachi	7	3	..	19
27 Adoni	..	..	..	6
28 Cannanore	..	16	..	..
29 Chidambaram	..	..	4	..
30 Cuddapah	..	4	..	3
31 Dindigul	17	..	5	30
32 Karaikudi	..	2	..	16
33 Kurnool	..	2	19	7
34 Karur	1	..	..	..
35 Mayavaram	..	..	..	31
36 Palni	..	..	9	8
37 Palamcottah	..	..	..	15
38 Tiruppur	4	17	21	41
39 Virudunagar	7	5	3	5
40 Udamalpet	10	..	..	..
41 Anantapur	1	..	..	..
42 Saidapet	3	5	1	..
43 Sembiem	..	..	..	1
44 Bodinayakanur	1	..	1	5
45 Devakottai	1	1	2	1
46 Peddapuram	..	2	..	..
47 Proddatur	2	..	..	..
48 Srivilliputtur	..	..	1	..
49 Tellicherry	11	4	2	5
50 Tiruvannamalai	1	2	3	..
51 Chicacole	..	..	3	..
52 Chingleput	..	..	16	23
53 Chittoor	..	..	..	2
54 Dharapuram	2	..	4	4
55 Gudiyattam	..	..	..	1
56 Kodaikanal	13	11	..	9
57 Mannargudi	..	2	..	1
58 Narasaraopet	2	1	2	2
59 Palacole	..	..	..	9
60 Srirangam	7	8	1	1
61 Sivakasi	..	..	1	..
62 Tirupati	2	..	..	..
63 Tiruppattur (Rd.)	..	1	2	..
64 Vaniyambadi	..	1	..	..
65 Udipi	..	1	..	..
66 Villupuram	3	..	..	2

TABLE No. IV—*cont.*

Statement showing the number of extra samples sent by local bodies during the years 1942–1946—*cont.*

Name of local body.	Year ending 30th September 1942.	Year ending 30th September 1943.	Year ending 30th September 1944.	Years (1st October 1944 to 31st March 1946).
PANCHAYATS.				
1 Ambur	..	..	..	12
2 Amalapuram	..	2	2	..
3 Alandur	..	..	..	4
4 Arni	2	..	..	1
5 Aruppukkottai	..	..	3	3
6 Ayyampet	..	1	1	2
7 Avanashi	..	..	6	..
8 Batlagundu	..	..	..	2
9 Bhavani	..	..	1	9
10 Bhimavaram	13	..	1	..
11 Bhuvanagiri	..	..	..	2
12 Bobbili	2	1	..	1
13 Courtallam	..	..	..	18
14 Dharmavaram	..	..	..	1
15 Dharmapuri	..	..	..	1
16 Dhone	..	..	..	7
17 Gudur (Nl.)	..	..	..	1
18 Giddalore	..	..	..	1
19 Gobichettipalaiyam	6	10	2	18
20 Gooty	..	..	..	1
21 Guntakal	..	..	8	10
22 Kadayanallur	..	..	..	4
23 Kallakurichi	..	..	..	6
24 Kalahasti	..	..	1	..
25 Kalladaikurichi	..	..	..	2
26 Kandukur	..	..	1	..
27 Kulittalai	..	..	..	12
28 Kuppam	..	..	3	3
29 Kurichi	..	..	..	1
30 Kovvur (W. G.)	..	..	2	1
31 Madanapalle	..	..	..	5
32 Madurantakam	..	..	..	7
33 Mandapeta	..	..	..	..
34 Mangalagiri	..	..	..	1
35 Manapparai	..	..	1	..
36 Melapalaiyam	..	..	1	2
37 Musiri	..	..	..	1
38 Namakkal	..	..	..	1
39 Nayudupet	..	..	..	1
40 Nellikuppam	..	..	..	1
41 Nilakottai	..	..	..	5
42 Nuzvid	..	..	2	..
43 Palakonda	..	1	..	3
44 Papanasam	..	..	..	5
45 Paramakudi	..	3	..	..
46 Panruti	..	..	..	5
47 Parvatipur	..	..	..	6
48 Pattukkottai	..	..	..	3
49 Perala	..	..	..	2
50 Pithapuram	1	..	1	..
51 Punganur	..	2	..	..
52 Ramnad	..	..	3	8
53 Rajampet	..	..	1	5
54 Rasipuram	..	..	..	5
55 Repalle	..	7	..	..
56 Shevaroys	..	..	..	7
57 Shiyali	..	..	..	3
58 Sholavandan	..	..	7	3
59 Sivaganga	..	..	..	2
60 Srivaikuntam	..	..	1	2
61 Tenkasi	..	1	..	..
62 Tiruchengode	..	..	..	4
63 Tirukkoyilur	..	..	..	9
64 Tiruttani	..	1	1	1
65 Tirumangalam	..	..	..	1
66 Tiruppattur	..	..	1	..

TABLE No. IV—*cont.*

Statement showing the number of extra samples sent by local bodies during the years 1942–1946—cont.

Name of local body.	Year ending 30th September 1942.	Year ending 30th September 1943.	Year ending 30th September 1944.	Years (1st October 1944 to 31st March 1946).
PANCHAYATS—*cont.*				
67 Tiruvadi	..	..	..	4
68 Tiruvallur	1	..	..	..
69 Tuni	1	..	1	2
70 Tiruvottiyur	..	..	4	..
71 Uravakonda	..	7	22	5
72 Usilampatti	..	..	..	1
73 Vayalpad	..	4	4	4
74 Venkatagiri	..	..	..	1
75 Vriddhachalam	..	..	..	15
76 Yemmiganur	..	..	..	1
77 Yellamanchili	..	..	..	1
78 Viravanallur	..	..	..	2
Total ..	483	311	444	966

TABLE No. V.

Total number of samples taken and percentage adulterated in each local body during the years 1942–1944.

MUNICIPALITIES.

	1941–1942.			1942–1943.			1943–1944.		
	Total.	Ad.	Per cent. Ad.	Total.	Ad.	Per cent. Ad.	Total.	Ad.	Per cent. Ad.
Class A.									
1 Madura	599	117	19·7	601	166	27·6	585	209	35·7
2 Bezwada	353	173	49·0	364	163	44·7	350	140	40·1
3 Coimbatore	302	185	61·3	277	186	67·1	358	209	58·4
4 Guntur	283	101	35·7	291	115	39·5	284	101	35·6
5 Salem	288	102	35·4	288	103	35·8	277	114	41·5
6 Trichinopoly	326	113	34·7	337	175	51·9	328	176	53·8
7 Calicut	151	43	28·5	152	57	37·5	161	69	42·9
8 Cocanada	147	97	66·0	150	117	78·0	166	127	76·5
9 Conjeeveram	144	59	41·0	165	81	49·1	180	73	40·8
10 Cuddalore	144	31	21·6	145	44	30·4	141	44	31·2
11 Ellore	144	34	23·6	142	33	23·3	135	34	25·2
12 Kumbakonam ..	186	63	33·9	142	59	41·6	144	73	50·7
13 Mangalore	142	44	31·0	147	81	55·1	142	66	46·5
14 Masulipatam ..	144	49	34·1	145	38	26·2	143	54	37·0
15 Negapatam	143	42	29·4	145	53	36·5	155	53	34·4
16 Ootacamund	179	58	32·4	176	57	32·4	172	65	37·2
17 Rajahmundry ..	145	67	46·2	186	123	66·1	225	111	49·5
18 Tanjore	146	48	32·9	155	72	46·5	197	86	43·6
19 Tinnevelly	172	93	54·1	151	96	63·6	153	98	64·0
20 Tuticorin	146	39	26·7	145	33	22·8	143	49	27·3
21 Vellore	157	66	42·6	152	47	35·9	142	52	36·6
22 Vizagapatam	113	57	50·5	174	115	61·1	272	165	60·9
Class B.									
23 Adoni	88	38	43·2	102	31	30·4	96	34	35·4
24 Bellary	87	48	55·2	119	72	60·5	104	46	44·2
25 Coonoor	101	50	49·5	101	68	67·3	96	57	59·4
26 Dindigul	113	37	32·7	96	37	38·5	99	52	52·5
27 Erode	97	35	36·1	96	41	42·6	93	54	58·0
28 Hospet	95	37	39·0	96	34	35·4	95	36	37·9
29 Kurnool	91	22	24·2	92	26	28·3	98	40	41·0
30 Nellore	97	18	18·6	112	48	42·9	140	59	42·1
31 Palghat	95	38	40·0	104	57	54·8	141	77	54·6
32 Saidapet	99	45	45·5	101	28	27·7	·94	27	29·0
33 Virudunagar	104	57	54·9	101	50	49·5	98	51	51·2
34 Vizianagram	92	20	21·7	94	36	38·3	97	47	48·5
35 Udamalpet	91	52	57·2	96	44	45·8	94	37	39·4
36 Sembium Panchayat ..	97	29	29·9	95	32	33·7	93	35	37·1
37 Anantapur	64	23	35·9	78	27	34·6	73	34	47·2
38 Hindupur	75	20	26·7	72	21	29·2	57	29	49·9

TABLE No. V—*cont.*

Total number of samples taken and percentage adulterated in each locol body during the years 1942–1944—cont.

MUNICIPALITIES—*cont.*

Class C.

	1941–1942.			1942–1943.			1943–1944.		
	Total.	Ad.	Per cent. Ad.	Total.	Ad.	Per cent. Ad.	Total.	Ad.	Per cent. Ad.
39 Proddatur	62	21	33·9	72	15	20·8	68	18	26·6
40 Tenali	71	36	50·7	73	31	42·5	67	31	44·1
41 Anakapalle	24	17	70·9	57	36	64·9	71	49	69·0
42 Bodinayakanur	50	14	28·0	48	21	43·8	48	13	27·0
43 British Cochin	48	24	50·0	48	30	62·5	45	22	48·8
44 Cannanore	48	12	25·0	93	53	57·0	93	50	53·8
45 Chicacole	51	33	64·7	31	13	41·9	48	31	64·6
46 Chidambaram	48	22	45·9	47	25	53·2	51	29	56·9
47 Chingleput	48	22	45·9	48	28	58·3	62	38	61·3
48 Chittoor	44	22	50·0	49	22	44·9	49	20	40·8
49 Cuddapah	48	30	62·5	88	51	57·9	92	40	43·5
50 Dharapuram	50	22	44·0	48	24	50·0	51	30	58·8
51 Devakottai	47	18	38·3	49	25	51·0	51	36	70·6
52 Gudivada	47	31	66·0	47	23	49·0	48	29	60·4
53 Gudiyattam	48	18	37·5	46	7	15·2	46	25	54·3
54 Karaikudi	48	19	39·6	51	40	78·4	47	23	48·9
55 Karur	49	30	61·3	48	25	52·1	46	23	50·0
56 Kodaikanal	61	23	37·7	59	19	32·2	46	7	15·2
57 Mannargudi	48	24	50·0	50	17	34·0	47	18	38·3
58 Mayavaram	48	15	31·3	46	18	39·1	47	22	46·8
59 Nandyal	8	3	37·5	48	9	18·8	48	28	58·6
60 Narasaraopet	46	13	28·3	49	17	34·7	48	19	39·9
61 Ongole	50	12	24·0	48	18	37·5	47	15	31·7
62 Palacole	48	18	37·5	44	16	36·4	45	11	24·9
63 Palamcottah	50	23	46·0	48	21	43·8	48	23	47·7
64 Palni	48	16	33·3	48	22	45·8	72	30	41·8
65 Peddapuram	48	23	47·9	62	22	35·5	70	30	42·0
66 Periyakulam	48	14	29·2	48	20	41·7	47	15	34·7
67 Pollachi	55	24	43·6	63	34	53·9	69	38	55·2
68 Rajapalaiyam	48	23	47·9	48	36	75·0	71	25	35·2
69 Srirangam	56	18	32·1	56	32	57·2	47	25	53·2
70 Srivilliputtur	48	22	45·9	48	29	60·4	48	27	54·3
71 Tadpatri	47	13	27·7	46	12	26·1	48	25	52·8
72 Tellicherry	59	20	33·9	50	27	54·0	52	20	37·2
73 Tirupati	51	22	43·1	42	15	25·7	48	19	39·6
74 Tiruppur	52	28	53·9	64	44	68·7	74	43	58·1
75 Tiruppattur (N.A.)	49	20	40·8	49	18	36·7	46	23	50·0
76 Tiruvarur	44	23	52·3	48	23	47·9	47	22	46·7
77 Tiruvannamalai	49	19	38·8	72	24	33·3	74	45	60·8
78 Udipi	33	22	66·7	49	40	81·6	44	31	70·5
79 Vaniyambadi	48	30	42·5	49	22	44·9	48	30	62·5
80 Villupuram	51	23	45·1	48	19	39·6	47	24	51·6
81 Bimlipatam	..	..	..	30	14	46·6	43	16	34·9
82 Sivakasi	..	..	..	28	14	50·0	49	19	38·7
83 Walajahbad	..	..	..	4	24	16·7	38	10	26·3

PANCHAYATS.

Class C.

	1941–1942.			1942–1943.			1943–1944.		
	Total.	Ad.	Per cent. Ad.	Total.	Ad.	Per cent. Ad.	Total.	Ad.	Per cent. Ad.
84 Arni	49	22	44·9	45	23	51·1	50	29	58·0
85 Ambasamudram	49	23	46·9	47	16	34·1	44	19	43·1
86 Ambur	48	28	58·3	48	28	58·3	47	33	70·2
87 Amalapuram	49	29	59·2	50	30	60·0	50	26	52·0
88 Avanashi	48	13	27·1	32	9	28·1	50	13	26·0
89 Avanigadda	18	10	55·5	34	6	17·6	36	3	8·3
90 Badvel	26	12	46·1	40	9	22·5	39	13	33·3
91 Bapatla	48	20	41·7	45	8	17·8	45	22	48·9
92 Bhimavaram	60	31	51·7	52	24	46·2	45	16	35·0
93 Bobbili	49	20	40·8	49	19	38·8	48	31	64·2
94 Chirala	47	7	14·9	50	11	22·0	41	11	26·8
95 Dharmavaram	20	3	15·0	37	17	46·0	52	23	44·2
96 Dharmapuri	48	34	70·9	38	18	47·3	42	22	52·0
97 Gudur	10	3	30·0	2	..	..	..	..	..
98 Gobichettipalaiyam	54	20	37·0	58	20	34·5	49	23	46·9
99 Jammalamadugu	48	14	29·2	42	6	14·3	43	6	13·6
100 Kadiri	47	18	38·3	46	24	52·2	46	21	43·5

TABLE No. V—*cont.*

Total number of samples taken and percentage adulterated in each local body during the years 1942–1944—*cont.*

PANCHAYATS—*cont.*

Class C—cont.

	1941–1942.			1942–1943.			1943–1944.		
	Total.	Ad.	Per cent. Ad.	Total.	Ad.	Per cent. Ad.	Total.	Ad.	Per cent. Ad.
101 Kalahasti	24	14	58·3	46	16	34·8	49	17	34·7
102 Koilpatti	38	22	57·0	40	20	50·0	48	23	47·9
103 Kavali	51	20	39·2	37	11	29·7	51	18	35·3
104 Madanapalle	37	8	21·6	48	15	31·2	48	20	41·7
105 Mangalagiri	30	20	66·7	42	18	42·9	52	15	28·8
106 Markapur	48	6	12·5	46	6	13·0	46	6	13·0
107 Mettupalaiyam ..	48	30	62·5	48	36	75·0	46	26	56·5
108 Melur	48	22	45·9	48	10	20·8	47	31	65·9
109 Narasapur	44	12	27·3	55	23	41·8	44	13	28·9
110 Nuzvid	48	18	37·5	48	17	35·4	48	21	43·7
111 Palakonda	45	3	6·7	49	12	24·5	46	16	34·8
112 Parvathipur	32	6	18·8	26	3	11·5	52	24	46·1
113 Perala	48	5	10·4	47	9	19·1	39	4	10·2
114 Penukonda ..	44	18	40·9	40	22	55·0	38	11	28·9
115 Pithapuram	46	12	26·1	43	7	16·3	47	6	12·8
116 Ponnur	23	3	13·0	26	4	15·4	23	4	17·4
117 Nidubrolu	16	3	18·8	12	1	8·3	25	10	40·0
118 Pulivendla	11	1	9·1	61	15	24·6	47	15	32·6
119 Rayachoti	8	3	37·5	41	21	51·2	29	13	44·8
120 Salur	48	12	25·0	47	13	27·7	42	15	35·7
121 Samalkot	47	20	42·5	35	23	65·7	37	25	67·6
122 Sankarankoil ..	49	20	40·0	48	24	50·0	44	26	59·0
123 Sulurpet	45	7	15·6	44	9	20·5	47	13	27·6
124 Tadepalligudem ..	44	15	33·3	50	21	42·0	42	19	45·2
125 Tanuku	47	18	38·3	46	18	39·1	50	13	26·1
126 Tenkasi	32	28	87·5	48	31	64·6	47	25	53·2
127 Tiruvur	43	7	16·3	51	9	17·7	42	8	10·0
128 Tiruchendur	38	5	13·2	35	7	20·0	42	18	42·8
129 Tiruttani	24	12	50·0	49	25	51·0	46	33	73·3
130 Tiruvallur	55	23	41·8	48	28	58·3	40	24	60·0
131 Tuni	48	8	16·7	34	10	29·4	38	16	42·0
132 Venkatagiri	47	9	19·2	44	7	15·9	47	21	42·5
133 Vetapalem	47	12	25·5	38	5	13·2	44	4	9·3
134 Tirumalai Hills ..	2	1	50·0	48	14	29·2	46	11	21·7
135 Kuppam	..	..	..	49	28	57·1	44	26	59·0
136 Pattukkottai	..	..	..	33	11	33·3	46	11	23·9
137 Punganur	..	..	..	42	21	50·0	44	13	29·5
138 Ramachandrapuram ..	..	..	..	45	20	44·4	44	13	29·5
139 Shiyali	..	..	..	33	23	69·7	53	28	52·8
140 Srivaikuntam	..	..	..	32	14	43·7	49	28	57·1
141 Vayalpad	..	..	..	28	18	64·3	36	18	50·0
142 Kovur (Nellore) ..	..	..	..	26	15	57·7	44	12	27·3
143 Rajampet	..	..	..	13	9	69·2	25	11	44·0
144 Courtallam	..	..	..	33	22	66·7	55	25	45.4
145 Rasipuram	..	..	..	32	22	68·7	47	29	61·7
146 Idapadi	..	..	..	17	7	41·2	30	17	56·6
147 Chodavaram	..	..	..	20	11	55.0	33	15	46·9
148 Aruppukkottai ..	..	..	..	25	11	4·04	51	14	27·4
149 Ayyampet	..	..	..	21	15	71·4	45	11	24·4
150 Repalle	..	..	..	31	20	64·5	40	12	30·0
151 Shevaroys	..	..	..	12	9	75·0	48	14	29·1
152 Arcot	..	..	..	24	15	62·5	47	21	44·7
153 Arkonam	..	..	..	18	8	100·0	46	35	77·7
154 Jaggayyapet	..	..	..	20	14	70·0	49	31	63·2
155 Allinagaram	..	..	..	8	5	62·5	52	19	36·5
156 Manapparai	..	..	..	10	6	60·0	48	36	75·0
157 Paramakudi	..	..	..	21	7	33·3	46	31	67·4
158 Namakkal	..	..	..	12	8	66·6	51	34	66·7
159 Ramnad	..	..	..	12	6	50·0	50	23	46·0
160 Sattur	..	..	..	12	6	50·0	47	19	42·2
161 Palmaner	..	..	..	4	3	75·0	48	27	56·3
162 Melapalayam	..	..	..	12	5	41·7	48	32	66·6
163 Uravakonda	..	..	..	15	7	46·7	67	36	53·7
164 Nidadavolu	..	..	..	8	5	62·5	45	27	56·8
165 Mandapeta	..	..	..	4	1	25·0	46	18	39·1
166 Turaiyur	..	..	..	4	..	..	45	25	55·6

TABLE

CLASS A—

Number of samples received and found adulterated from municipalities working the 31st March

Number and name of municipality.	Quota of samples.	Total. Total.	Total. Ad.	Total. Percentage Ad.	Milk. Total.	Milk. Ad.	Ghee. Total.	Ghee. Ad.
1 Madura	100	1,265	518	40·9	915	450	90	37
2 Bezwada	30	520	242	46·5	348	219	84	13
3 Trichinopoly ..	28	482	313	64·9	391	288	17	7
4 Calicut	24	406	241	58·0	326	233	26	4
5 Coimbatore ..	24	439	236	53·7	238	200	99	11
6 Guntur	24	423	241	56·9	273	225	90	7
7 Salem	24	422	215	50·9	210	154	99	28
8 Vizagapatam ..	24	404	189	46·9	338	186	21	2
9 Cocanada	18	318	206	64·7	232	199	47	4
10 Ootacamund ..	18	285	132	46·3	217	128	22	..
11 Rajahmundry ..	18	318	190	59·7	222	177	29	6
12 Mangalore ..	18	509	211	41·4	485	209	9	1
13 Tanjore	18	336	127	37·8	131	84	40	12
14 Tinnevelly ..	18	308	142	46·1	235	132	9	4
15 Anakapalle ..	12	188	113	60·0	145	110	3	1
16 Bellary	12	216	105	48·6	118	80	36	6
17 Conjeeveram ..	12	263	128	48·6	171	86	20	6
18 Coonoor	12	202	101	50·0	180	101	7	..
19 Cuddalore	12	211	97	45·9	157	91	6	1
20 Ellore	12	211	65	26·0	159	53	20	..
21 Kumbakonam ..	12	247	120	48·5	191	105	13	4
22 Masulipatam ..	12	214	101	47·2	82	74	68	12
23 Negapatam ..	12	220	98	44·5	178	95	2	..
24 Nellore	12	207	99	47·8	104	84	71	13
25 Palghat	12	230	104	48·8	180	96	10	2
26 Tuticorin	12	208	76	36·5	129	53	12	4
27 Vellore	12	218	87	39·9	162	78	20	4
28 Pollachi	10	171	112	65·5	150	110	6	2
Total ..	..	9,424	4,590	48·8	6,667	4,100	976	191

NOTE.—Ad. = Adulterated.

TABLE

CLASS B—

Number of samples received and found adulterated from municipalities working the 31st March

NOTE.—Ad. = Adulterated. The miscellaneous samples

Number and name of municipality.	Total. Total.	Total. Ad.	Total. Percentage Ad.	Milk. Total.	Milk. Ad.	Ghee. Total.	Ghee. Ad.
						Quota 8	
1 Adoni	145	76	52·4	93	63	22	2
2 Cannanore	139	66	47·5	67	58	28	2
3 Chidambaram	138	76	55·0	97	73	3	1
4 Cuddapah	134	62	46·2	110	57	7	3
5 Dindigul	167	74	44·3	120	64	5	4
6 Erode	138	64	46·4	112	60	8	1
7 Gudivada	102	61	60·0	54	52	11	3
8 Hospet	133	37	27·8	68	31	14	4
9 Karaikudi	139	70	50·3	101	64	9	3
10 Kurnool	142	56	39·4	86	48	30	4
11 Karur	133	94	70·6	86	77	5	..
12 Mayavaram	147	87	59·2	84	68	6	2
13 Ongole	106	52	49·0	72	46	29	5
14 Palni	147	89	60·5	98	78	12	4
15 Saidapet	140	45	32·9	59	39	17	1
16 Tenali	127	89	70·0	104	86	30	1
17 Tiruppur	170	73	42·9	133	71	5	0
18 Virudunagar	144	70	48·6	93	57	..	..
19 Vizianagram	132	57	'43·1	100	44	16	6
20 Udamalpet	137	65	47·4	104	57	9	2
21 Sembiam Pt.	141	37	26·0	50	24	12	..
Total ..	2,901	1,400	48·2	1,891	1,217	270	48

No. VI-A.

Local Bodies.

Prevention of Adulteration Act during the period 1st October 1944 to 1946.

Butter.		Gingelly oil.		Groundnut oil.		Coffee.		Tea.		Coconut oil.		Miscellaneous.	
Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.
8	1	157	21	8	1	55	0	3	0	8	0	30	8
25	3	29	2	21	4	4	1	..	..	..	..	..	..
8	2	63	16	..	..	2	0	1	0	..	..	..	..
1	0	32	3	1	1	2	0	15	0	..	..	3	0
..	..	71	19	2	0	10	1	2	0	3	0	14	5
1	0	33	3	6	1	9	0	..	..	..	..	11	5
..	..	19	32	9	1	14	0	..	..	..	..	..	..
16	0	20	1	8	0	1	0	..	..	..	..	..	..
2	0	36	2	1	1	..	..	..	..	..	..	..	..
5	0	30	4	..	..	7	0	..	..	2	0	2	0
5	2	31	2	3	0	10	0	2	0	1	0	8	3
1	0	3	1	..	..	3	0	2	0	6	0	..	..
30	19	100	10	22	2	11	0	1	0	1	0	..	..
1	0	53	6	1	0	5	0	2	0	1	0	1	0
..	..	39	2	..	..	1	0	..	..	..	..	..	..
26	11	11	4	6	1	7	0	..	..	5	2	7	1
..	..	61	33	7	1	..	..	..	..	..	..	4	2
1	..	10	0	..	..	2	0	2	0	..	..	..	..
1	..	46	5	1	0	..	..	..	..	..	..	..	..
1	0	15	1	10	1	3	0	..	..	..	..	3	0
4	2	33	6	..	..	..	..	..	..	6	3	..	..
14	8	43	6	4	0	..	..	..	..	1	0	2	1
..	..	37	3	..	..	2	0	1	0	..	..	..	..
..	..	19	2	1	0	2	0	..	..	6	0	4	0
1	0	20	6	2	0	..	..	..	..	..	..	..	..
5	0	32	9	7	0	4	2	4	0	..	..	15	8
2	2	22	2	6	0	1	0	..	..	..	..	5	1
3	0	4	0	..	..	4	0	3	0	1	0	..	..
161	50	1,140	201	126	14	168	4	38	0	41	5	107	34

No. VI-B.

Local Bodies.

Prevention of Adulteration Act during the period 1st October 1944 to 1946.

include honey, turmeric, kusumac oil, chicory sweets, etc.

Samples.

Butter.		Gingelly oil.		Groundnut oil.		Coffee powder.		Tea.		Coconut oil.		Miscellaneous.	
Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.
15	5	2	2	..	..	4	1	..	..	1	0	8	3
1	0	4	0	..	..	2	2	33	4	..	..	4	0
2	0	29	2	..	..	7	0	..	..	..	..	..	..
7	1	4	0	..	..	5	0	..	..	..	..	1	1
10	1	28	5	2	0	2	0	..	..	..	..	..	..
..	..	7	0	..	..	5	0	..	..	6	3	..	..
6	1	22	3	3	1	1	0	..	..	4	1	1	0
24	0	2	0	2	0	16	0	..	..	1	0	6	2
3	0	22	3	..	..	4	0	..	..	..	..	..	..
1	0	5	1	..	..	4	1	..	..	1	1	6	1
6	2	30	15	..	..	1	0	1	0	1	0	3	0
4	3	47	13	1	0	5	1	..	..	..	..	..	..
0	0	1	0	1	0	..	..	..	..	2	0	1	1
1	0	20	6	..	..	8	0	4	0	..	..	4	1
4	0	49	4	8	0	1	0	..	..	..	..	2	1
2	0	5	1	2	1	..	..	..	..	..	..	1	0
..	..	21	1	2	0	6	0	2	0	..	..	1	1
..	..	27	2	5	1	5	1	1	0	1	0	12	9
..	..	13	7	3	0	..	..	..	..	..	..	..	..
..	..	17	5	..	..	6	1	1	0	..	..	..	..
2	1	26	5	34	2	1	0	2	0	..	..	14	5
88	14	382	75	63	5	83	7	44	4	18	6	63	24

TABLE

CLASS C—

Number of samples received and found adulterated from municipalities work
31st March

Number and name of municipality.	Total.			Milk.		Ghee.	
	Total.	Ad.	Percentage Ad.	Total.	Ad.	Total.	Ad.
							Munici
							Quota 6
1 Anantapur	108	67	62·0	79	65	14	0
2 Devakottai	71	48	67·6	57	45	5	1
3 Hindupur	118	65	55·1	77	62	19	0
4 Peddapuram	105	39	37·1	71	38	9	0
5 Prodattur	103	24	23·3	48	21	33	1
6 Rajapalayam	104	51	49·0	70	44	6	1
7 Srivilliputtur	103	52	50·5	62	44	2	0
8 Tiruvannamalai	102	59	57·8	67	46	5	2
							Quota 4
9 Bimilipatam	64	27	42·1	56	24	6	3
10 Bodinayakanur	80	20	25·0	54	15	..	..
11 British Cochin	68	24	35·3	41	22	6	1
12 Chicacole	69	33	47·8	49	32	6	0
13 Chingleput	89	32	35·9	56	25	3	0
14 Chittoor	72	42	58·3	43	38	11	4
15 Dharapuram	74	46	62·1	53	46	4	0
16 Gudiyattam	68	34	50·0	32	24	10	2
17 Kodaikanal	75	21	28·0	56	18	2	0
18 Mannargudi	71	26	36·6	28	22	8	2
19 Nandyal	71	34	47·9	52	34	8	0
20 Narasaraopet	70	26	37·1	30	23	4	0
21 Palacole	79	39	49·3	46	32	13	5
22 Palamcottah	84	50	59·5	67	45	4	0
23 Periyakulam	71	34	47·9	50	31	4	1
24 Srirangam	69	42	60·8	52	41	7	1
25 Sivakasi	70	20	28·5	48	15	..	..
26 Tadpatri	70	24	34·3	38	21	18	2
27 Tellicherry	79	33	41·7	43	24	25	4
28 Tirupathi	72	40	55·5	48	37	11	1
29 Tiruppattur (N.A.)	71	32	45·0	42	28	10	1
30 Tiruvarur	67	32	47·7	48	29	8	0
31 Udipi	71	49	69·0	67	49	2	0
32 Vaniyambadi	69	36	52·1	39	32	14	2
33 Villupuram	70	35	50·6	41	33	7	0
34 Wallajapet	73	37	50·6	41	28	..	..
Total ..	1,886	868	46·0	1,220	768	191	29

CLASS C—

Number of samples received and found adulterated from Panchayats

Number and name of panchayat.	Total.			Milk.		Ghee.	
	Total.	Ad.	Percentage Ad.	Total.	Ad.	Total.	Ad.
1 Avanigadda	40	5	12·5	1	1	11	1
2 Gudur	2	1	50·0	..	..	..	..
3 Lalgudi	51	40	78·0	37	33	5	2
4 Karur	3	3	100·0	3	3	..	..
5 Sompet	48	32	66·6	38	28	2	1
6 Akividu	72	26	36·0	30	21	15	2
7 Ambasamudram	73	40	54·8	55	37	3	0
8 Ambur	84	65	77·3	79	62	2	0
9 Amalapuram	71	33	46·4	31	26	16	4
10 Alanthur	70	36	51·4	42	30	6	2

No. VI-C.

LOCAL BODIES.

ing the Prevention of Adulteration Act during the period 1st *October* 1944 *to* 1946.

	Butter.		Gingelly oil.		Groundnut oil.		Coffee powder.		Tea.		Coconut oil.		Miscellaneous.	
	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.
palities.														
Samples.														
	..	..	5	0	..	..	7	1	..	..	..	..	3	1
	..	..	7	1	..	..	1	0	..	..	1	1	..	..
	..	..	3	1	1	0	13	0	..	..	2	2	3	0
	1	1	18	0	..	..	6	0	..	..	..	..	..	..
	4	0	6	0	..	..	7	0	..	..	..	..	5	2
	1	0	14	3	1	0	4	0	6	1	..	..	2	2
	2	1	30	7	..	..	2	0	..	..	3	0	2	0
	..	..	23	9	3	2	3	0	..	..	..	..	..	..
Samples.														
	..	..	1	0	1	0	..	..	..	..	..	..	..	..
	..	..	22	4	1	0	2	0	..	..	..	..	1	4
	1	0	14	1	..	..	1	0	2	0	3	0	..	..
	..	..	6	1	5	0	3	0	..	..	..	..	..	..
	..	..	15	5	13	2	..	..	..	..	2	0	..	..
	..	..	14	0	4	0	..	..	..	..	..	..	..	..
	..	..	6	0	1	0	3	0	7	0	..	..	..	..
	..	..	22	8	3	0	..	..	..	..	1	0	..	..
	1	0	10	3	1	0	5	0	..	..	..	..	..	..
	..	..	35	2	..	..	..	..	..	..	..	..	..	..
	..	..	3	0	..	..	2	0	..	..	3	0	3	0
	8	0	18	2	..	..	2	0	..	..	4	0	4	1
	3	2	15	0	2	0	..	..	..	..	..	..	..	..
	1	1	11	4	..	..	1	0	..	..	1	0	..	..
	1	0	5	0	3	0	7	2	..	..	1	0	..	..
	1	0	4	0	..	..	2	0	..	..	3	0	3	0
	..	..	17	5	..	..	1	0	1	0	3	0	..	..
	..	..	9	1	..	..	2	0	..	..	..	..	3	0
	..	..	8	5	..	..	..	..	2	0	1	0	..	..
	1	0	9	1	1	1	1	0	..	..	..	..	1	0
	..	..	9	2	3	1	5	0	1	0	..	..	1	0
	3	2	8	1	..	..	..	..	..	..	..	..	..	..
	..	..	..	..	..	..	2	0	..	..	..	..	..	..
	1	1	7	0	3	1	..	..	2	0	2	0	1	0
	1	0	18	2	1	0	..	..	2	0	..	..	..	..
	..	..	31	9	..	..	1	0	..	..	..	..	..	..
	22	6	317	56	42	5	40	2	17	0	20	0	17	2

PANCHAYATS.

during the period 1st *October* 1944 *to* 31st *March* 1946.

Butter.		Gingelly oil.		Groundnut oil.		Coffee powder.		Tea.		Coconut oil.		Miscellaneous	
Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.
2	0	10	0	1	1	9	0	..	..	1	0	5	2
..	..	..	..	1	0	..	..	..	..	..	..	1	1
4	3	4	2	..	..	1	0	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	4	3	4	0	..	..	..	..	..	..	..	..
..	..	15	3	..	..	3	0	..	..	3	0	6	0
..	..	8	2	..	..	4	0	3	1	..	..	..	..
..	..	3	3	..	..	..	..	..	..	..	..	..	..
..	..	17	2	1	1	6	0	..	..	..	..	..	..
..	..	10	3	7	0	3	0	..	..	1	0	1	1

TABLE

CLASS C—

Number of samples received and found adulterated from Panchayats

Number and name of panchayat.	Total			Milk.		Ghee.	
	Total.	Ad.	Per-centage Ad.	Total.	Ad.	Total.	Ad.
11 Allinagaram	68	26	38·2	36	21	6	0
12 Arcot	68	26	38·2	43	26	8	0
13 Arkonam	70	47	67·1	66	47	..	..
14 Ariyalur	67	45	67·1	51	39	..	..
15 Arni	60	25	41·6	34	20	17	3
16 Aruppukottai	67	27	40·3	41	24	..	..
17 Ayyampet	72	35	48·6	40	32	..	..
18 Avanashi	64	14	21·8	62	13	..	..
19 Badvel	70	24	34·2	27	18	21	2
20 Bapatla	68	31	45·6	41	31	17	0
21 Bhavani	78	60	76·9	61	57	..	..
22 Bhimavaram	65	26	40·0	25	23	19	1
23 Bobbili	67	33	49·2	42	28	5	1
24 Bhuvanagiri	30	12	40·0	19	10	..	..
25 Chirala	60	16	26·6	12	10	5	0
26 Chodavaram	71	21	29·5	18	18	6	1
27 Chinnamanoor	27	16	59·2	17	13	2	0
28 Courtallam	89	32	35·9	79	30	..	..
29 Ettayapuram	43	13	30·2	21	12	4	0
30 Dharmavaram	69	15	21·7	28	14	15	0
31 Dharmapuri	62	38	61·3	44	31	5	1
32 Dhone	53	18	33·9	44	16	5	1
33 Gudur Nl.	71	43	60·5	36	34	12	0
34 Giddalore	67	17	25·3	13	10	28	1
35 Gobichettipalaiyam	81	30	37·0	74	30	3	0
36 Gooty	49	34	69·4	37	31	9	1
37 Guntakal	78	47	60·2	58	46	10	1
38 Idappady	70	34	48·5	45	30	..	..
39 Jaggayyapet	47	20	42·5	25	17	10	0
40 Jammalamadugu	64	19	29·7	38	17	17	1
41 Kadiri	71	35	49·3	65	35	3	0
42 Kadayanallur	76	49	64·4	67	49	4	0
43 Kallakurichi	66	54	81·8	63	53	..	..
44 Kalahasti	66	30	45·4	39	29	10	0
45 Kallidaikurichi	40	30	75·0	35	28	3	2
46 Kandukur	71	16	22·5	18	11	36	3
47 Kavali	71	27	38·0	33	24	26	2
48 Koilpatti	72	47	65·2	62	46	2	0
49 Kotagiri	27	18	66·6	25	18	..	..
50 Kovvur W. G.	71	31	43·7	37	29	14	2
51 Kulittalai	82	56	68·3	72	53	4	2
52 Kuppam	72	23	31·9	72	23	..	..
53 Kurichi	29	24	82·7	23	19	..	..
54 Kovvur Nl.	65	8	12·0	18	6	11	0
55 Madanapalle	70	30	42·8	46	25	98	1
56 Madurantakam	60	47	78·5	49	43	5	3
57 Mandapeta	64	15	23·4	18	10	6	0
58 Mangalagiri	74	32	43·3	40	27	11	2
59 Manapparai	69	31	45·0	53	26	..	..
60 Markapur	45	8	17·8	19	8	15	0
61 Melapalaiyam	70	45	64·2	53	39	3	2
62 Melur	67	46	68·7	59	42	3	2
63 Mettupalaiyam	68	36	53·0	49	36	17	0
64 Musiri	48	32	66·6	39	28	4	3
65 Namakkal	64	45	70·4	49	39	6	1
66 Narasapur	64	22	34·4	31	19	26	2
67 Nayudupet	73	22	30·1	46	17	5	0
68 Nellikuppam	71	35	49·3	50	30	2	1
69 Nilakkottai	28	18	64·3	18	13	..	..
70 Nidadavolu	62	40	64·5	49	38	5	2
71 Nuzvid	70	28	40·0	34	24	8	0
72 Palakonda	71	12	16·9	43	7	6	1
73 Pallattur	71	25	35·2	60	22	2	1
74 Palmaner	50	25	50·0	38	25	2	0
75 Panruti	73	32	43·9	51	29	6	1

No. VI C—*cont.*

PANCHAYATS—*cont.*

during the period 1st *October* 1944 *to* 31st *March* 1946—*cont.*

Butter.		Gingelly oil.		Groundnut oil.		Coffee powder.		Tea.		Coconut oil.		Miscellaneous.	
Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.
..	..	11	5	..	..	13	0	..	..	2	0	..	..
..	..	16	0	..	..	1	0	..	..	..	..	..	..
..	..	2	0	1	0	..	..	..	..	1	0	..	..
1	0	15	6	..	..	..	..	..	..	..	..	..	..
..	..	8	2	..	..	1	0	..	..	..	..	..	..
..	..	16	2	1	0	8	1	..	..	1	0	..	..
2	0	26	3	..	..	..	..	..	..	..	..	4	0
..	..	1	1	..	..	..	..	..	..	..	..	1	0
..	..	2	0	1	0	11	2	..	..	3	0	5	2
..	..	2	0	1	0	3	0	..	..	2	0	2	0
..	..	12	3	3	0	1	0	..	..	..	..	1	0
..	..	10	1	2	0	1	0	..	..	3	1	5	0
..	..	11	4	6	0	..	..	..	..	1	0	2	0
..	..	7	1	1	1	2	0	1	0	..	..	..	..
25	4	15	2	..	..	..	..	..	..	..	..	3	0
3	1	22	1	..	..	22	0	..	..	..	..	..	..
..	..	6	2	..	..	1	0	..	..	..	..	1	1
..	..	6	0	..	..	3	1	..	..	..	..	1	1
..	..	9	0	..	..	8	1	1	0	..	..	..	..
..	..	2	0	1	0	18	0	1	0	..	..	4	1
..	..	11	6	1	0	1	0	..	..	..	..	..	..
..	..	1	1	..	..	1	0	..	..	1	0	1	0
..	..	7	3	6	1	4	1	..	..	..	..	6	4
..	..	4	1	3	0	3	2	2	0	3	0	11	3
..	..	..	..	1	..	2	0	..	..	1	0	..	..
..	..	2	1	..	..	1	1	..	..	..	..	..	..
2	0	2	0	..	..	1	0	..	..	3	0	2	0
..	..	14	4	3	0	1	0	..	..	7	0	..	..
..	..	1	0	..	..	1	0	..	..	2	0	8	3
..	..	1	0	..	..	4	0	..	..	1	0	3	1
..	..	..	..	..	..	3	0	..	..	..	..	..	..
..	..	4	0	..	..	1	0	..	..	..	..	..	..
..	..	3	1	..	..	..	..	..	..	..	..	..	..
..	..	7	0	3	1	4	0	..	..	2	0	1	0
..	..	2	0	..	..	..	..	..	..	..	..	..	..
..	..	4	1	..	..	4	1	3	0	2	0	4	0
..	..	3	0	1	0	3	1	..	..	2	0	3	0
..	..	3	0	1	0	3	1	..	..	1	0	..	..
..	..	1	0	..	..	..	..	1	0	..	..	..	..
2	0	11	0	4	0	3	0	..	..	..	..	..	..
1	1	4	0	..	..	1	0	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	5	5	..	..	1	0	..	..	..	..	..	..
..	..	17	0	..	..	15	1	..	..	4	1	..	..
..	..	5	0	..	..	3	0	..	..	1	0	6	4
..	..	6	1	..	..	..	..	..	..	..	..	..	..
21	2	8	0	..	..	4	1	..	..	1	0	6	2
1	0	5	0	1	1	1	0	..	..	2	1	13	1
1	0	10	4	1	1	2	0	..	..	2	0	..	..
..	..	4	0	1	0	4	0	..	..	..	..	2	0
1	0	6	2	..	..	7	2	..	..	..	..	..	..
..	..	1	1	..	..	2	0	..	..	2	1	..	..
..	..	..	..	2	0	..	..	..	..	..	..	..	..
..	..	4	1	..	..	1	0	..	..	..	..	..	..
..	..	7	4	1	1	1	0	..	..	..	..	..	..
..	..	3	0	..	..	..	..	..	..	1	0	3	1
..	..	11	0	..	..	3	0	..	..	2	1	6	4
..	..	15	2	..	..	4	2	..	..	..	..	..	..
..	..	6	3	..	..	..	..	..	..	4	2	..	..
2	0	4	0	..	..	2	0	..	..	..	..	..	..
..	..	8	4	14	0	2	0	..	..	..	..	4	0
..	..	18	3	1	0	1	0	..	..	..	..	2	1
..	..	4	2	2	0	3	0	..	..	..	..	..	..
..	..	4	0	1	0	2	0	..	..	..	..	3	..
..	-	13	1	1	1	2	..	..	..	..	..	..	..

TABLE
CLASS C—

Number of samples received and found adulterated from Panchayats

Number and name of panchayat.	Total. Total.	Total. Ad.	Total. Percentage. Ad.	Milk. Total.	Milk. Ad.	Ghee. Total.	Ghee. Ad.
76 Papanasam	75	40	53·3	54	34	1	0
77 Paramakudi	68	38	55·9	54	36	1	1
78 Parvatipur	73	30	41·1	59	29	4	1
79 Pattukkottai	71	29	40·8	26	21	3	1
80 Perala	70	1	1·4	3	..	2	0
81 Penukonda	71	18	25·3	39	16	25	0
82 Pithapuram	72	11	15·3	20	9	15	1
83 Ponnur	29	2	6·5	7	2	6	0
84 Nidubrolu	24	4	16·7	4	2	2	0
85 Poonamallee	69	26	37·7	28	16	4	1
86 Pulivendla	54	16	29·9	21	11	21	1
87 Punganur	40	6	15·0	6	4	5	0
88 Puttur	46	26	56·6	30	23	4	1
89 Ramachandrapuram ..	72	35	48·6	42	33	15	1
90 Ramnad	76	48	63·2	62	47	1	1
91 Rajampet	54	28	51·8	27	17	3	0
92 Ranipet	27	20	74·1	24	20	..	..
93 Rasipuram	61	33	54·2	34	31	4	0
94 Rayachoti	63	27	42·8	43	20	3	2
95 Razole	61	27	44·3	42	23	7	3
96 Rayadrug	68	19	28·0	57	18	4	0
97 Repalle	69	30	43·5	33	22	5	2
98 Salur	68	19	28·0	52	18	..	..
99 Samalkot	53	15	28·3	43	14	1	0
100 Sankarankoil	74	43	58·1	61	43	5	0
101 Sattenapalle	61	31	50·8	34	22	4	1
102 Shevaroys	76	17	22·4	69	16	7	1
103 Shiyali	73	25	34·3	35	21	8	2
104 Sholavandan	73	37	50·9	48	30	9	4
105 Sivaganga	72	37	51·4	58	31	2	2
106 Sattur	70	20	28·5	59	19	2	0
107 Srivaikuntam	71	33	46·6	49	32	3	1
108 Sulurpet	72	22	30·6	26	14	5	2
109 Tadepalligudem	68	21	30·9	24	17	7	0
110 Tanuku	70	25	35·9	43	23	4	0
111 Tenkasi	67	37	55·3	47	36	2	0
112 Tindivanam	67	38	56·9	51	34	5	2
113 Tiruchendur	69	33	47·9	44	26	6	3
114 Tiruchengode	65	38	59·5	42	37	4	0
115 Tirukkoyilur	71	17	24·0	35	15	11	1
116 Tiruttani	64	43	67·2	53	38	4	1
117 Tirumalai Hills	70	14	20·0	26	11	16	2
118 Tirumangalam	36	21	58·3	17	13	..	..
119 Tiruppattur Rd.	70	35	50·0	50	29	5	2
120 Tiruturaipundi	19	11	59·9	10	10	2	0
121 Tiruvur	70	17	24·2	11	8	25	3
122 Trivady	57	46	80·7	44	41	3	2
123 Tiruvadamarudur	19	11	57·9	12	8	..	..
124 Trivellore	75	45	60·0	55	37	3	0
125 Tuni	62	21	33·5	37	16	10	3
126 Turaiyur	71	41	57·7	47	34	3	0
127 Tiruvottiyur	67	20	30·0	18	9	3	2
128 Uravakonda	73	26	35·6	22	16	18	4
129 Vayalpad	51	22	43·1	30	18	8	2
130 Venkatagiri	62	26	41·9	31	21	12	0
131 Vetapalem	68	17	25·0	13	8	18	0
132 Yemmiganur	62	26	41·9	28	22	12	0
133 Usilampatti	20	11	53·0	14	7	1	0
134 Viravanallur	30	15	50·0	25	14	..	..
135 Venkateswarapuram ..	3	3	100·0	..	..	..	..
136 Cumbum	14	9	64·3	11	8	..	..
137 Batlagundu	18	9	50·0	14	8	..	..
138 Yellamanchili	13	10	77·0	10	10	2	0
139 Vriddhachalam	34	29	85·3	34	29	..	..
140 Ayakudy	8	0	..	5	0	..	..
[illegible]iyangudi	8	2	25·0	5	2	..	..

No. VI-C—*cont.*

PANCHAYATS—*cont.*

during the period 1st October 1944 *to* 31*st March* 1946—cont.

Butter.		Gingelly oil.		Groundnut oil.		Coffee powder.		Tea.		Coconut oil.		Miscellaneous.	
Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.	Total.	Ad.
..	..	13	4	1	0	1	0	..	..	2	0	3	2
..	..	9	0	2	0	2	1	..	..	..	..	..	..
..	..	3	0	3	0	..	..	..	..	..	..	4	0
..	..	29	5	1	0	7	0	..	..	2	0	3	2
49	1	9	0	2	0	2	0	..	..	1	0	2	0
..	..	1	0	2	0	2	0	..	..	1	1	1	1
..	..	33	1	..	..	2	0	..	..	..	..	2	0
1	0	5	0	2	0	..	..	..	..	4	0	4	0
3	1	2	0	4	0	3	0	..	..	2	0	4	1
..	..	14	6	16	2	5	1	2	0	..	..	..	..
1	0	..	..	..	..	3	0	..	..	..	..	8	4
..	..	3	0	8	0	2	0	..	..	..	..	16	2
..	..	6	1	5	0	..	..	..	..	..	..	1	1
..	..	11	1	..	..	3	0	..	..	..	..	1	0
..	..	6	0	..	..	5	0	1	0	1	0	..	..
..	..	15	5	1	1	..	..	..	..	..	..	8	5
..	..	3	0	..	..	..	..	..	..	..	..	..	..
..	..	12	2	1	0	3	0	..	..	6	0	1	0
..	..	2	1	..	..	4	0	..	..	..	..	11	4
..	..	8	1	..	..	3	0	..	..	1	0	..	..
..	..	1	1	..	..	6	0	..	..	..	..	..	..
10	2	12	3	..	..	2	1	..	..	1	0	6	0
..	..	8	1	1	0	..	..	..	..	..	..	7	0
..	..	5	1	1	0	3	0	..	..	..	..	..	..
..	..	9	0	..	..	..	..	..	..	..	..	..	..
1	0	12	7	5	0	1	0	..	..	1	0	3	1
..	..	..	..	..	..	..	..	..	..	..	..	..	..
3	0	21	1	..	..	6	1	..	..	..	..	..	..
..	..	11	3	1	0	2	0	..	..	..	..	2	0
..	..	5	1	1	0	4	1	..	..	..	..	2	2
..	..	4	0	1	0	..	..	1	0	1	0	2	1
..	..	14	0	..	..	2	0	..	..	3	0	..	..
..	..	34	6	..	..	6	0	..	..	1	0	..	..
4	0	6	0	10	2	1	0	..	..	6	0	10	2
4	2	1	0	4	0	11	0	..	..	1	0	2	0
..	..	9	1	..	..	6	0	..	..	..	..	3	0
..	..	9	2	..	..	2	0	..	..	..	..	..	..
..	..	13	0	..	..	4	2	..	..	..	..	2	2
..	..	11	1	2	0	3	0	..	..	..	..	3	0
1	0	16	1	..	..	3	0	..	..	..	..	5	0
..	..	4	1	1	1	..	..	..	..	..	..	2	2
1	1	25	0	..	..	2	0	..	..	..	..	..	..
..	..	19	8	..	..	..	..	..	..	..	..	..	..
..	..	12	3	..	..	..	..	2	0	1	1	..	..
..	..	7	1	..	..	..	..	..	..	..	..	..	..
..	..	6	2	5	0	3	1	..	..	..	..	20	3
..	..	8	2	..	..	..	..	..	..	..	..	2	1
..	..	7	3	..	..	..	..	..	..	..	..	..	..
..	..	13	7	3	1	1	0	..	..	..	..	..	..
..	..	10	2	..	..	..	..	..	..	1	0	4	0
1	1	17	5	1	0	..	..	..	..	2	1	..	..
2	0	22	6	5	0	2	0	3	0	..	..	12	3
..	..	..	..	4	0	4	1	..	..	6	0	19	5
..	..	4	1	2	0	2	0	..	..	4	1	1	0
..	..	15	2	..	..	1	0	..	..	1	1	2	2
1	0	22	6	..	..	1	0	..	..	..	..	13	3
7	0	1	0	..	..	4	3	1	0	..	..	9	1
..	..	5	4	..	..	..	..	..	..	..	..	..	..
..	..	5	1	..	..	..	..	..	..	..	..	..	..
..	..	3	3	..	..	..	..	..	..	..	..	..	..
..	..	2	1	..	..	1	0	..	..	..	..	..	..
..	..	4	1	..	..	..	..	..	..	..	..	..	..
..	..	1	0	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	3	0	..	..	..	..	..	..	..	..	..	..
..	..	3	0	..	..	..	..	..	..	..	..	..	

TABLE No. VII.

Statement showing the number of convictions, total fines, average fines, fines in non-analysis cases and grand total of the fines in each of the local bodies, during the years 1941–42, 1942–43 and 1943–44.

Name of local body.	1941–42. Analysis cases. Number of convictions.	Total fines.	Average fine.	Fines in non-analysis cases.	Grand total.	1942–43. Analysis cases. Number of convictions.	Total fines.	Average fine.	Fines in non-analysis cases.	Grand total.	1943–44. Analysis cases. Number of convictions.	Total fines.	Average fine.	Fines in non-analysis cases.	Grand total.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		RS.	RS.	RS.	RS.		RS.	RS.	RS.	RS.		RS.	RS.	RS.	RS.
1 Madura	112	4,059	36	418	4,477	145	8,989	62	..	8,989	202	16,060	79	..	16,060
2 Bezwada	167	3,455	21	31	3,486	153	4,540	30	..	4,540	133	4,449	33	..	4,449
3 Trichinopoly ..	108	2,769	26	29	2,798	164	4,972	30	..	4,972	166	5,495	33	..	5,495
4 Calicut	25	1,170	47	30	1,200	46	3,112	68	..	3,112	64	6,040	94	..	6,040
5 Coimbatore ..	184	6,420	35	55	6,475	184	8,597	47	..	8,597	189	12,975	69	..	12,975
6 Guntur	96	2,488	26	92	2,580	114	4,979	44	..	4,979	91	4,992	55	..	4,992
7 Salem	102	2,909	29	15	2,924	101	3,767	37	..	3,767	108	4,721	44	..	4,721
8 Vizagapatam ..	55	1,247	23	31	1,278	108	3,326	31	..	3,326	155	5,750	37	..	5,750
9 Cocanada	94	2,956	31	41	2,997	107	3,056	29	156	3,212	122	3,732	31	99	3,831
10 Ootacamund ..	54	2,071	38	5	2,076	53	2,555	48	..	2,555	63	3,705	59	..	3,705
11 Rajahmundry ..	62	1,959	32	16	1,975	111	3,520	32	..	3,520	107	3,710	35	..	3,710
12 Mangalore ..	37	1,020	28	..	1,020	67	3,060	46	..	3,060	54	1,970	37	..	1,970
13 Tanjore	45	1,200	27	60	1,260	70	3,075	44	26	3,101	82	3,730	45	29	3,759
14 Tinnevelly ..	85	2,325	27	52	2,377	85	2,765	33	..	2,765	95	3,443	36	..	3,443
15 Anakapalle ..	18	405	23	40	445	37	1,145	31	..	1,145	44	1,645	37	8	1,653
16 Bellary	41	1,013	25	83	1,096	69	3,242	47	90	3,332	43	2,315	54	83	2,398
17 Conjeeveram ..	57	1,820	32	..	1,820	73	3,424	47	..	3,424	72	2,780	38	..	2,780
18 Coonoor	50	1,520	30	70	1,590	64	4,230	66	..	4,230	52	3,060	59	75	3,135
19 Cuddalore ..	30	835	28	32	867	43	1,385	32	..	1,385	42	1,536	37	65	1,601
20 Ellore	27	745	28	25	820	26	1,207	50	..	1,207	29	1,361	47	..	1,361
21 Kumbakonam ..	60	1,390	23	30	1,420	58	1,887	33	..	1,887	73	3,030	41	..	3,030
22 Masulipatam ..	41	1,018	25	..	1,018	35	1,085	31	..	1,085	46	1,225	27	..	1,225
23 Nellore	18	510	28	..	510	42	1,045	25	..	1,045	57	1,830	32	..	1,830
24 Palghat	37	1,465	40	..	1,465	56	3,705	66	..	3,705	76	6,095	80	..	6,095
25 Tuticorin	38	912	24	50	962	32	1,130	35	..	1,130	40	2,437	61	202	2,639
26 Vellore	57	1,974	35	40	2,074	37	2,115	57	100	2,215	45	2,010	45	..	2,010
27 Pollachi	22	616	28	413	1,049	32	1,600	50	..	1,600	37	1,880	51	..	1,880
28 Negapatam ..	39	603	15	12	615	53	2,285	43	..	2,285	43	2,175	43	..	2,175
29 Adoni	38	1,210	32	53	1,263	29	918	32	..	918	34	1,075	32	..	1,075
30 Cannanore ..	12	360	30	35	395	50	1,570	31	39	1,609	50	3,455	69	102	3,557
31 Chidambaram ..	21	500	24	20	520	23	925	40	..	925	28	1,400	50	..	1,400
32 Cuddapah	29	700	24	..	700	49	2,290	47	..	2,290	40	1,610	40	..	1,610

33 Dindigul	36	1,380	38	36	1,416	34	1,374	37	3	1,377	51	2,050	40	28	2,078
34 Erode	35	725	21	40	765	41	1,990	49	..	1,990	54	3,400	63	..	3,400
35 Gudivada	29	672	23	50	722	21	601	29	..	601	29	945	33	25	970
36 Hospet	36	775	22	51	826	33	676	21	10	686	34	1,200	35	..	1,200
37 Karaikudi	19	495	26	..	495	39	2,580	66	..	2,580	22	1,815	82	..	1,815
38 Kurnool	20	693	35	19	709	25	920	37	..	920	31	1,585	51	49	1,634
39 Karur	30	1,924	64	150	2,074	25	1,180	47	..	1,180	23	1,113	48	..	1,113
40 Mayavaram	15	384	26	..	384	18	990	55	..	990	22	1,040	47	..	1,040
41 Ongole	12	382	32	40	422	18	652	36	41	693	15	860	57	..	860
42 Palni	15	770	51	35	805	21	1,017	48	110	1,127	28	1,380	49	175	1,555
43 Saidapet	37	992	27	90	1,082	25	810	32	..	810	19	685	16	..	685
44 Tenali	35	654	19	15	669	27	1,436	61	..	1,436	26	1,165	45	..	1,165
45 Tiruppur	27	820	30	..	820	42	2,210	53	..	2,210	43	3,150	73	..	3,150
46 Virudunagar	55	1,286	23	25	1,311	50	2,082	42	..	2,082	51	3,240	63	..	3,240
47 Udamalpet	31	1,345	43	50	1,395	44	1,690	38	..	1,690	35	1,390	40	..	1,390
48 Sembiem	26	703	27	3	706	27	1,010	37	16	1,026	31	1,270	41	32	1,302
49 Vizianagram	..	..	..	..	..	..	..	..	..	..	46	2,145	..	..	2,145
50 Anantapur	19	805	42	73	878	25	801	32	..	801	33	743	32	..	743
51 Hindupur	19	635	33	5	640	20	444	22	..	444	24	716	30	..	716
52 Devakottai	15	610	41	..	610	24	992	41	..	992	36	1,745	48	..	1,745
53 Peddapuram	22	690	31	21	711	22	715	33		715	30	1,185	39	..	1,185
54 Proddatur	20	494	25	..	494	14	975	70	..	975	18	1,255	69	55	1,310
55 Rajapalaiyam	23	546	24	..	546	36	1,502	42	..	1,502	24	1,350	56	..	1,350
56 Srivilliputtur	22	550	25	..	550	27	1,090	40	..	1,090	23	1,305	57	210	1,515
57 Tiruvannamalai	16	710	44	65	775	25	780	31	..	780	42	1,410	34	..	1,410
58 Bimlipatam	..	..	..	..	..	14	695	50	..	695	15	745	49	..	745
59 Bodinayakkanur	14	475	34	..	475	19	1,150	61	58	1,208	11	715	65	..	715
60 Br. Cochin	15	434	29	..	434	24	800	33	..	800	17	955	56	..	955
61 Chicacole	32	818	26	..	818	13	432	33	41	473	29	1,327	46	171	1,498
62 Chingleput	21	359	17	20	379	26	765	29	..	765	36	1,312	36	55	1,367
63 Chittoor	21	374	18	25	399	21	745	36	120	865	19	900	47	130	1,030
64 Dharapuram	22	500	25	80	580	26	885	34	..	885	30	1,235	41	..	1,235
65 Gudiyattam	16	490	31	5	495	7	220	31	..	220	25	905	36	..	905
66 Kodaikanal	23	1,106	48	102	1,208	16	1,165	73	5	1,170	7	255	36	..	255
67 Mannargudi	24	454	19	53	507	16	559	35	..	559	16	840	52	..	840
68 Nandyal	2	200	100	..	200	7	350	50	..	350	25	912	36	..	912
69 Narasaraopet	12	520	43	10	530	17	610	36	..	610	19	945	50	..	945
70 Palacole	18	349	20	16	365	13	535	41	..	535	10	480	48	..	480
71 Palamcottah	23	775	34	..	775	20	717	36	..	717	19	719	38	..	719
72 Periyakulam	13	409	31	40	449	15	660	44	55	715	14	1,090	78	60	1,150
73 Srirangam	18	535	30	..	535	30	1,085	36	..	1,085	24	751	31	..	751
74 Sivakasi	..	..	..	..	..	14	373	27	..	373	19	1,515	80	..	1,515
75 Tadpatri	12	290	24	28	318	10	350	35	..	350	22	558	25	..	558
76 Tellicherry	19	535	28	..	535	25	1,025	41	..	1,025	18	1,545	86	..	1,545
77 Tirupati	21	948	45	62	1,010	14	870	63	..	870	18	915	51	..	915

TABLE No. VII—*cont.*

Statement showing the number of convictions, total fines, average fines, fines in non-analysis cases and grand total of the fines in each of the local bodies, during the years 1941–42, 1942–43 *and* 1943–44—cont.

Name of local body.	1941–42.					1942–43.					1943–44.				
	Analysis cases.		Average fine.	Fines in non-analysis cases.	Grand total.	Analysis cases.		Average fine.	Fines in non-analysis cases.	Grand total.	Analysis cases.		Average fine.	Fines in non-analysis cases.	Grand total.
	Number of convictions.	Total fines.				Number of convictions.	Total fines.				Number of convictions.	Total fines.			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		RS.	RS.	RS.	RS.		RS.	RS.	RS.	RS.		RS.	RS.	RS.	RS.
78 Tiruppattur ..	20	425	21	20	445	18	845	53	..	845	21	895	43	..	895
79 Tiruvarur	23	372	16	..	372	23	830	36	..	830	22	885	40	..	885
80 Udipi	22	466	21	..	466	40	931	23	15	946	30	895	30	..	895
81 Vaniyambadi ..	26	910	35	165	1,075	21	601	29	..	601	30	1,544	51	..	1,544
82 Villupuram ..	17	540	32	..	540	15	315	21	..	315	23	890	38	..	890
83 Walajapet ..	..	..	..	..	..	3	75	25	..	75	10	370	37	..	370
84 Avanigadda panchayat.	6	35	6	..	35	5	117	23	..	117	1	50	50	..	50
85 Lalgudi	..	..	..	..	..	..	..	..	..	..	2	40	20	..	40
86 Ambasamudram ..	23	670	29	3	673	14	676	48	50	726	18	895	49	50	945
87 Ambur	24	1,092	45	10	1,102	27	1,025	38	..	1,025	32	1,815	57	..	1,815
88 Amalapuram ..	28	714	26	4	718	27	760	28	10	770	25	820	33	40	860
89 Allinagaram ..	..	..	..	..	..	5	330	66	..	330	18	1,225	68	..	1,225
90 Arcot	..	..	..	..	..	14	365	26	..	365	21	805	38	..	805
91 Arkonam ..	..	..	..	..	..	18	795	44	..	795	30	1,400	47	..	1,400
92 Ariyalur	..	..	..	..	..	..	..	..	..	..	15	505	34	50	555
93 Arni	22	585	27	70	655	23	563	25	..	563	29	965	33	..	965
94 Aruppukkottai ..	..	..	..	..	..	11	510	46	..	51	13	935	72	30	965
95 Ayyampet ..	..	..	..	..	..	9	555	62	..	555	11	750	68	..	750
96 Avanashi	12	370	31	..	370	9	340	38	15	355	11	555	50	80	635
97 Badvel	12	177	15	65	242	9	264	29	5	269	13	530	41	..	530
98 Bapatla ..	20	485	24	53	538	7	316	24	75	391	21	883	42	..	883
99 Bhavani	..	..	..	..	..	..	..	..	..	..	23	895	37	..	895
100 Bhimavaram ..	27	519	..	120	639	26	810	31	..	810	16	690	43	..	690
101 Bobbili	19	510	19	50	560	18	700	39	105	805	29	1,065	37	92	1,157
102 Chirala	7	277	40	..	277	11	610	56	..	610	11	465	42	..	465
103 Chodavaram ..	..	..	..	..	..	8	302	38	..	302	10	420	42	..	420
104 Courtallam ..	..	..	..	..	..	21	880	42	..	880	24	1,010	42	25	1,035
105 Dharmavaram ..	2	12	6	..	12	12	300	25	..	300	19	487	26	..	487
106 Dharmapuri ..	32	621	20	30	651	13	485	37	..	485	21	571	27	..	571
107 Gudur (NL) ..	..	..	..	..	..	..	..	..	..	..	3	140	47	..	140
108 Giddalore ..	..	..	..	..	..	..	..	..	..	..	3	47	16	..	47
109 Gobichettipalaiyam	20	430	22	40	470	20	880	44	200	1,080	23	1,265	55	100	1,365
110 Guntakal ..	..	..	..	..	..	..	..	..	..	..	21	460	22	70	530

111 Idappadi ..	..	..	..	..	..	7	140	20	..	140	14	350	25	..	350
112 Jaggayyapet	..	..	..	..	..	14	375	27	5	380	30	677	23	..	677
113 Jammalamadugu.	14	550	40	50	600	6	280	47	5	285	6	120	20	..	120
114 Kadiri ..	17	470	28	50	520	22	662	30	..	662	18	755	42	..	755
115 Kadayanallur	..	..	..	..	..	..	..	..	..	..	3	180	60	..	180
116 Kalahasti	13	370	28	40	.410	14	500	36	25	525	14	755	54	3	758
117 Kandukur	..	..	..	..	..	..	..	..	..	..	15	735	49	..	735
118 Kavali ..	17	342	20	50	392	10	355	36	..	355	70	520	31	..	520
119 Koilpatti	21	486	23	..	486	14	910	65	25	935	23	850	37	..	850
120 Kovvur (WG)	..	..	..	..	..	..	..	..	..	..	16	600	38	59	659
121 Kulittalai	..	..	..	..	..	..	..	..	..	..	9	570	63	90	660
122 Kuppam ..	..	..	..	..	..	28	780	28	15	795	21	815	31	7	822
123 Kovvur (NL)	..	..	..	..	..	15	360	24	..	360	11	325	29	..	325
124 Madanapalle	6	335	56	..	335	12	285	24	..	285	19	795	42	..	795
125 Mandapeta	..	..	..	..	..	1	50	50	..	50	18	725	40	..	725
126 Mangalagiri	19	441	23	..	441	17	555	33	..	555	15	355	24	..	355
127 Manapparai	..	..	..	..	..	6	185	31	..	185	35	1,332	38	..	1,332
128 Markapur	5	60	12	..	60	5	205	41	..	205	5	225	45	..	225
129 Melapalaiyam	..	..	..	..	..	5	204	41	35	239	31	1,253	40	80	1,333
130 Melur ..	21	688	33	50	738	9	185	21	50	235	31	980	32	182	1,162
131 Mettupalayam	30	1,050	35	..	1,050	35	1,775	51	..	1,775	26	1,345	52	..	1,345
132 Namakkal	..	..	..	..	..	8	270	34	50	320	33	1,725	52	120	1,845
133 Narasapur	12	300	26	..	300	23	1,315	57	..	1,315	12	647	54	..	647
134 Nayudupet	..	..	..	..	..	..	..	..	..	..	19	690	36	..	690
135 Nellikuppam	..	..	..	..	..	..	..	..	..	..	19	830	44	..	830
136 Nidadavole	..	..	..	..	..	5	250	50	..	250	27	850	31	10	860
137 Nuzvid ..	15	388	25	28	416	16	406	25	50	456	17	476	28	..	476
138 Palkonda	3	75	25	..	75	11	260	24	..	260	15	246	16	..	246
139 Pallattur ..	..	..	..	..	..	..	..	..	..	..	11	770	77	100	870
140 Palmaner ..	..	..	..	..	..	1	50	50	..	50	22	567	26	..	567
141 Panrutti ..	..	..	..	..	..	..	..	..	..	..	9	350	38	55	405
142 Papanasam	..	..	..	..	..	..	..	..	..	..	8	220	28	..	220
143 Paramakudi	..	..	..	..	..	7	195	28	..	195	29	711	24	..	711
144 Parvatipur	6	195	33	..	195	3	85	28	..	85	23	935	41	..	935
145 Pattukkottai	..	..	..	..	..	11	433	39	..	433	7	425	61	..	425
146 Perala ..	5	145	29	10	155	6	310	52	..	310	4	175	44	10	185
147 Penukonda	16	317	20	48	365	19	653	34	15	668	7	285	41	..	285
148 Pithapuram	9	405	45	..	405	6	220	37	..	220	6	270	45	50	320
149 Ponnur ..	2	50	25	..	50	4	125	31	..	125	3	125	41	..	125
150 Nidubrolu	1	25	25	..	25	1	10	10	..	10	9	395	44	25	420
151 Poonamallee	..	..	..	..	..	..	..	..	..	..	15	820	55	60	880
152 Pulivendla	1	5	5	..	5	15	330	22	65	395	14	690	49	10	700
153 Punganur ..	..	..	..	..	..	19	800	42	..	800	13	755	58	..	755
154 Ramachandra-puram.	..	..	..	..	..	19	1,133	54	..	1,133	12	395	33	..	395

TABLE No. VII—*cont.*

Statement showing the number of convictions, total fines, average fines, fines in non-analysis cases and grand total of the fines in each of the local bodies, during the years 1941–42, 1942–43 *and* 1943–44—cont.

Name of local body.	1941–42.					1942–43.					1943–44.				
	Analysis cases.		Average fines.	Fines in non-analysis cases.	Grand total.	Analysis cases.		Average fines.	Fines in non-analysis cases.	Grand total.	Analysis cases.		Average fines.	Fines in non-analysis cases.	Grand total.
	Number of convictions.	Total fines.				Number of convictions.	Total fines.				Number of convictions.	Total fines.			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		RS.	RS.	RS.	RS.		RS.	RS.	RS.	RS.		RS.	RS.	RS.	RS.
155 Ramnad	..	..	..	..	..	2	150	75	..	150	23	1,325	57	425	1,750
156 Rajampet	..	..	..	..	..	8	280	35	..	280	10	295	30	..	295
157 Rasipuram ..	..	..	..	..	..	21	510	24	..	510	19	690	36	..	690
158 Rayachoti ..	3	45	15	..	45	18	314	17	40	354	13	227	17	..	227
159 Rayadrug	..	..	..	..	..	..	..	..	..	..	7	175	25	..	175
160 Repalle	..	..	..	..	..	16	603	38	24	627	10	516	51	..	516
161 Salur	11	405	37	..	405	10	305	30	..	305	14	685	49	..	685
162 Samalkot	17	479	28	..	479	10	307	31	..	307	18	561	31	..	561
163 Sankarankoil ..	20	785	39	15	800	24	985	41	..	985	24	975	41	..	975
164 Shevaroys ..	..	..	..	..	..	9	360	40	..	360	13	375	29	..	375
165 Shiyali	..	..	..	..	..	22	955	43	..	955	27	1,115	41	..	1,115
166 Sholavandan ..	..	..	..	..	..	..	..	..	..	..	26	960	37	..	960
167 Sattur	..	..	..	..	..	6	137	24	..	137	18	1,145	64	..	1,145
168 Srivaikuntam ..	..	..	..	..	..	14	290	21	..	290	27	827	31	..	827
169 Sulurpet	6	125	21	..	125	9	195	22	..	195	13	365	28	..	365
170 Tadepalligudem ..	12	405	34	3	408	19	580	31	75	655	19	735	39	20	755
171 Tanuku	16	410	26	15	425	15	570	38	..	570	10	452	45	..	452
172 Tenkasi	27	995	37	57	1,052	31	1,635	53	20	1,655	25	1,209	48	100	1,309
173 Tindivanam ..	..	..	..	..	..	..	..	..	..	..	14	365	26	..	365
174 Tiruchendur ..	4	228	57	..	228	7	226	32	..	226	13	343	26	..	343
175 Tiruchengode ..	..	..	..	..	..	..	..	..	..	..	23	1,400	60	165	1,565
176 Tirukkoilur ..	..	..	..	..	..	..	..	..	..	..	6	360	60	..	360
177 Tiruttani ..	12	460	38	30	490	25	850	34	..	850	31	1,516	49	..	1516
178 Tirumalai Hills ..	1	200	200	..	200	13	770	59	..	770	9	345	32	25	370
179 Tirupattur Road ..	..	..	..	..	..	..	..	..	..	..	23	1,568	68	100	1,668
180 Tiruvur	5	87	17	39	136	7	110	16	..	110	7	170	24	..	170
181 Tiruvallur	19	582	31	8	590	28	613	22	..	613	24	564	24	..	564
182 Tuni	7	125	18	..	125	6	140	23	..	140	10	325	33	..	325
183 Turaiyur	..	..	..	..	..	..	..	..	..	..	23	1,145	50	..	1,145
184 Tiruvottiyur ..	..	..	..	..	..	..	..	..	..	..	22	875	40	..	875
185 Uravakonda ..	..	..	..	..	..	7	332	47	25	357	32	716	22	50	766
186 Vayalpad	..	..	..	..	..	17	1,105	65	50	1,155	17	840	49	..	840
187 Venkatagiri ..	7	130	17	..	130	7	165	24	..	165	20	477	24	50	527
188 Vetapalam ..	12	292	24	55	345	5	270	54	..	270	2	90	45	..	90

TABLE No. VIII.

Statement showing the total amount of fines levied, number of convictions, average fine, etc., 1944–46.

Name of local body.	Adulterated samples. Number of convictions.	Total fines.	Maximum fines.	Minimum fine.	Average fine.	Fines in non-analysis cases.	Grand total.
		RS.	RS.	RS.	RS.	RS.	RS.
MUNICIPALITIES.							
CLASS A.							
1 Madura	502	45,140	200	25	90	1,510	46,290
2 Bezwada	211	6,279	100	4	30	.	6,279
3 Trichinopoly ..	286	9,339	100	10	33	258	9,597
4 Calicut	211	17,759	400	10	84	..	17,759
5 Coimbatore ..	186	10,895	200	10	59	80	10,975
6 Guntur	196	8,914	200	10	45	..	8,914
7 Salem	212	7,119	100	7	34	133	7,252
8 Vizagapatam ..	181	6,240	100	10	34	..	6,240
9 Cocanada ..	203	7,024	80	5	35	16	7,040
10 Ootacamund ..	115	6,830	200	5	59	125	6,955
11 Rajahmundry ..	162	7,208	100	10	44	8	7,216
12 Mangalore ..	177	8,850	200	10	50	..	8,850
13 Tanjore	122	6,903	150	10	57	..	6,903
14 Tinnevelly ..	140	5,489	100	5	39	215	5,704
15 Anakapalle ..	111	4,325	100	10	39	8	4,333
16 Bellary	95	4,579	160	15	48	122	4,701
17 Conjeevaram ..	125	7,525	200	10	60	..	7,525
18 Coonoor	97	5,915	250	10	61	..	5,915
19 Cuddalore ..	96	3,094	170	10	32	282	3,376
20 Ellore	49	2,300	90	15	47	..	2,300
21 Kumbakonam ..	113	6,692	110	20	59	206	6,898
22 Masulipatam ..	82	2,354	50	10	29	..	2,354
23 Negapatam ..	97	4,169	82	16	43	..	4,169
24 Nellore	96	3,775	125	5	39	146	3,921
25 Palghat	101	11,015	225	75	109	215	11,230
26 Tuticorin	75	4,060	150	10	54	250	4,370
27 Vellore	78	3,706	125	10	48	..	3,706
28 Pollachi	111	6,165	200	10	56	185	6,350
MUNICIPALITIES.							
CLASS B.							
29 Adoni	69	3,370	200	10	49	635	4,005
30 Cannanore ..	64	5,935	200	20	93	100	6,035
31 Chidambaram ..	74	3,271	100	10	44	..	3,271
32 Cuddapah ..	57	1,869	100	5	33	..	1,869
33 Dindigul	70	4,335	100	15	62	237	4,572
34 Erode	65	3,315	100	10	51	110	3,425
35 Gudivada ..	68	1,772	80	10	26	244	2,116
36 Hospet	36	1,935	200	5	54	331	2,266
37 Karaikudi ..	69	3,697	200	15	53	..	3,697
38 Kurnool	55	2,925	150	15	53	331	3,256
39 Karur	99	3,651	105	12	37	150	3,801
40 Mayavaram ..	87	3,535	100	10	41	135	3,670
41 Ongole	50	2,267	100	10	45	130	2,397
42 Palni	88	7,095	200	10	71	233	7,328
43 Saidapet	42	2,658	150	10	63	..	2,658
44 Tenali	138	3,742	150	15	27	..	3,742
45 Tiruppur	71	5,470	100	15	77	600	6,070
46 Virudhunagar ..	65	4,060	100	25	62	..	4,060
47 Vizianagram ..	57	3,060	100	10	54	..	3,060
48 Udamalpet ..	62	1,982	80	10	32	..	1,982
49 Sembiam Post ..	31	2,483	200	25	80	..	2,483
CLASS C.							
Quota 6.							
50 Anantapur ..	64	1,911	150	5	19	..	1,911
51 Devakottai ..	47	2,549	110	10	54	50	2,599
52 Hindupur ..	63	1,540	75	6	24	114	1,654
53 Peddapuram ..	30	1,630	100	5	42	..	1,630
54 Prodattur ..	22	800	75	10	36	130	[illegible]

TABLE No. VIII—*cont.*

Statement showing the total amount of fines levied, number of convictions, average fine, etc., 1944–46—cont.

Name of local body.	Adulterated samples.					Fines in non-analysis cases.	Grand total.
	Number of conviction.	Total fines.	Maximum fines.	Minimum fines.	Average fine.		
		RS.	RS.	RS.	RS.	RS.	RS.
MUNICIPALITIES—*cont.*							
CLASS C—*cont.*							
Quota 6—cont.							
55 Rajapalayam ..	50	2,979	100	10	60	165	3,144
56 Srivilliputtur ..	52	3,070	100	15	59	215	3,285
57 Tiruvannamalai ..	55	2,110	100	10	38	95	2,110
Quota 4.							
58 Bimilipatam ..	27	1,345	150	10	50	150	1,495
59 Bodinayakkanur ..	16	1,331	200	50	83	..	1,331
60 Br. Cochin ..	20	1,250	120	5	63	..	1,250
61 Chicacole ..	32	1,100	100	5	34	15	1,115
62 Chingleput ..	31	1,775	100	10	57	30	1,805
63 Chittoor	40	1,703	100	15	43	25	1,728
64 Dharapuram ..	44	1,375	100	10	31	30	1,405
65 Gudiyattam ..	33	1,030	100	10	52	50	1,080
66 Kodaikanal ..	20	860	150	20	43	..	860
67 Mannargudi ..	26	1,400	100	30	54	..	1,400
68 Nandyal	34	1,435	200	15	45	215	1,650
69 Narasaraopet ..	26	1,206	80	25	46	42	1,248
70 Palacole	34	1,500	100	10	44	..	1,500
71 Palamcottah ..	49	2,309	100	5	47	6	2,315
72 Periyakulam ..	30	2,580	100	20	86	324	2,904
73 Srirangam ..	42	1,402	100	15	33	100	1,502
74 Sivakasi	19	1,595	100	20	84	300	1,895
75 Tadpatri	24	738	75	13	31	20	758
76 Tellicherry ..	31	2,765	150	25	89	20	2,785
77 Tirupati	40	2,427	200	10	61	5	2,432
78 Tiruppattur ..	31	1,615	105	25	52	..	1,615
79 Tiruvarur ..	30	1,190	90	15	40	440	1,630
80 Udipi	49	1,906	100	15	39	80	1,986
81 Vaniyambadi ..	36	2,076	200	15	68	69	2,145
82 Villupuram ..	33	1,314	70	15	40	100	1,414
83 Wallajapet ..	35	1,127	75	7	32	..	1,127
PANCHAYATS.							
CLASS C.							
84 Avanigadda ..	3	70	30	20	23	5	75
85 Lalgudi	36	1,260	75	15	35	150	1,410
86 Harur	3	175	100	25	58	..	175
87 Sompeta	31	1,140	80	15	37	..	1,140
88 Akividu	25	932	100	7	37	..	932
89 Ambasamudram.	39	1,191	80	10	31	38	1,229
90 Ambur	64	3,585	150	10	56	70	3,655
91 Amalapuram ..	33	1,070	80	10	32	..	1,070
92 Alandur	35	2,412	100	20	69	250	2,662
93 Allinagaram ..	22	2,005	100	50	91	..	2,005
94 Arcot	26	775	100	10	30	..	775
95 Arkonam	47	1,906	100	12	41	68	1,974
96 Ariyalur	44	1,795	100	20	41	50	1,845
97 Arni	25	820	75	15	33	5	825
98 Aruppukottai ..	26	1,765	100	5	68	16	1,930
99 Ayyampet ..	34	1,485	100	15	44	..	1,485
100 Avanashi	13	655	65	40	50	..	655
101 Badvel	22	740	100	10	34	..	740
102 Bapatla	31	1,319	100	15	43	..	1,657
103 Bhavani	59	1,960	100	15	33	..	1,960
104 Bhimavaram ..	22	725	80	15	33	..	725
105 Bobbili	32	1,525	200	15	48	55	1,580
106 Bhuvanagiri ..	11	295	80	5	27	80	1,375
107 Chirala	16	765	75	20	48	..	765
108 Chodavaram ..	19	1,150	100	25	61	..	1,150

TABLE No. VIII—*cont.*

Statement showing the total amount of fines levied, number of convictions, average fine, etc., 1944–46—cont.

Name of local body.	Adulterated samples. Number of convictions.	Total fines.	Maximum fines.	Minimum fines.	Average fine.	Fines in non-analysis cases.	Grand total.
		RS.	RS.	RS.	RS.	RS.	RS.
PANCHAYATS—*cont.*							
CLASS C—*cont.*							
109 Chinnamanur ..	16	846	100	25	53	..	846
110 Courtalam ..	31	1,452	150	10	47	40	1,492
111 Ettayapuram ..	10	405	90	25	41	..	405
112 Dharmavaram ..	15	515	80	10	34	..	515
113 Dharmapuri ..	37	1,225	100	5	33	5	1,230
114 Dhone	16	505	75	15	32	20	525
115 Gudur (NL) ..	41	1,635	110	5	40	20	1,655
116 Giddalore ..	16	690	100	15	43	..	690
117 Gobichettipalayam.	31	1,515	100	15	50	275	1,790
118 Gooty	34	1,275	100	5	38	..	1,275
119 Guntakal	47	1,735	100	15	37	..	1,735
120 Idappadi ..	32	870	80	5	27	..	870
121 Jaggayapet ..	20	680	60	5	34	45	725
122 Jammalamadugu.	18	475	60	15	26	15	490
123 Kadiri	35	1,068	100	5	31	100	1,168
124 Kadayanallur ..	48	1,541	100	5	32	..	1,541
125 Kallakurichi ..	54	1,473	75	8	27	..	1,473
126 Kalahasti ..	29	1,315	100	15	35	..	1,315
127 Kalladaikurichi ..	30	875	75	5	26	22	897
128 Kandukur ..	13	565	100	10	45	135	700
129 Kavali	25	819	75	15	33	69	888
130 Koilpatti	46	1,825	100	10	40	110	1,935
131 Kotagiri	17	935	105	50	55	..	935
132 Kovvur (W.G.) ..	30	1,192	75	10	39	60	1,252
133 Kulittalai	55	2,265	100	15	41	50	2,315
134 Kuppam	23	507	50	7	22	..	507
135 Kurichi	24	1,365	150	35	57	..	1,365
136 Kovvur (NL) ..	8	265	100	5	33	..	265
137 Madanapalle ..	28	1,490	100	25	53	235	1,725
138 Madurantakam ..	44	1,857	100	2	43	20	1,877
139 Mandapeta ..	15	620	75	20	41	..	620
140 Mangalagiri ..	31	1,108	100	12	36	60	1,168
141 Manaparai ..	28	893	100	7	32	..	893
142 Markapur ..	6	230	70	15	38	50	280
143 Melapalayam ..	41	1,701	93	7	41	210	1,911
144 Melur	43	1,150	80	10	27	294	1,277
145 Mettupalayam ..	36	1,540	100	20	43	..	1,540
146 Musiri	29	1,170	115	15	51	..	1,170
147 Namakkal ..	44	1,914	80	10	44	200	2,114
148 Narsapur	19	673	70	20	35	..	673
149 Nayudupet ..	22	860	100	10	39	..	860
150 Nellikuppam ..	34	1,615	100	10	48	40	1,615
151 Nilakottai ..	17	1,030	100	25	61	..	1,030
152 Nidadavole ..	47	1,330	70	15	30	105	1,435
153 Nuzvid	21	710	100	10	34	2	712
154 Palkonda ..	11	480	100	5	44	..	480
155 Pallattur ..	23	1,187	100	18	52	100	1,287
156 Palmaner ..	24	785	50	10	33	..	785
157 Panrutti	26	835	100	15	32	55	890
158 Papanasam ..	40	1,560	90	10	39	25	1,585
159 Paramakudi ..	38	1,540	100	15	41	..	1,540
160 Parvatipur ..	29	935	100	10	32	135	1,070
161 Pattukottai ..	27	2,095	125	25	78	..	2,095
162 Perala	2	80	60	20	40	..	80
163 Penukonda ..	18	697	100	10	39	..	697
164 Pithapuram ..	8	360	75	10	45	120	480
165 Ponnur	2	40	25	15	20	..	40
166 Nidubrolu ..	3	90	40	25	30	..	90
167 Poonamallee ..	26	1,374	175	5	53	385	1,759
168 Pulivendla ..	13	505	80	20	39	110	615
169 Punganur ..	6	240	100	20	40	..	240
170 Puttur	25	1,130	75	15	[illegible]		[illegible]

TABLE No. VIII—*cont.*

Statement showing the total amount of fines levied, number of convictions, average fine, etc., 1944–46—cont.

Name of local body.	Adulterated samples. Number of convictions.	Total fines.	Maximum fines.	Minimum fine.	Average fine.	Fines in non-analysis cases.	Grand total.
		RS.	RS.	RS.	RS.	RS.	RS.
PANCHAYATS—*cont.*							
CLASS C—*cont.*							
171 Ramachandrapuram.	35	1,025	70	5	29	83	1,108
172 Ramnad	47	2,670	200	10	57	615	2,765
173 Rajampet ..	23	835	75	5	36	40	875
174 Ranipet	20	625	75	20	31	..	625
175 Rasipuram ..	32	1,115	75	5	35	..	1,115
176 Rayachoti ..	26	960	70	10	37	..	960
177 Razole	23	1,086	100	1	47	..	1,086
178 Rayadrug ..	16	520	50	5	33	15	535
179 Repalle	26	910	75	15	35	..	910
180 Salur	19	965	160	10	51	..	265
181 Samalkot ..	12	287	50	10	24	..	287
182 Sankarankoil ..	43	2,422	115	5	58	220	2,542
183 Sattenapalle ..	21	885	100	25	42	..	885
184 Shevaroys ..	17	486	70	5	29	..	486
185 Shiyali	25	1,083	100	5	43	..	1,083
186 Sholavandan ..	30	1,816	100	21	61	..	1,816
187 Sivaganga ..	37	1,900	100	5	51	100	2,000
188 Sattur	20	1,575	100	20	79	10	1,585
189 Srivaikuntam ..	33	1,575	150	20	48	..	1,575
190 Sulurpet	20	510	75	10	26	..	510
191 Tadepalligudem ..	19	750	80	10	40	296	1,045
192 Tanuku	21	1,095	100	15	52	10	1,105
193 Tenkasi	37	1,760	100	15	47	110	1,876
194 Tindivanam ..	38	952	75	5	25	..	952
195 Tiruchendur ..	31	741	65	5	24	6	747
196 Tiruchengode ..	38	1,167	200	5	30	..	1,167
197 Tirukkoyilur ..	15	590	75	10	39	..	590
198 Tiruttani	41	2,345	150	5	57	13	2,358
199 Tirumalai Hills ..	13	540	100	10	42	40	580
200 Tirumangalam ..	19	900	100	5	47	20	920
201 Tiruppattur (R.D.)	35	1,642	100	15	38	85	1,727
202 Tiruturaipundi ..	11	540	80	30	49	..	540
203 Tiruvur	16	404	60	15	25	..	404
204 Trivadi	40	2,015	100	25	50	100	2,115
205 Tiruvadamarudur.	10	845	100	45	84	..	845
206 Tiruvallur ..	44	1,230	60	8	28	10	1,240
207 Tuni	15	930	100	10	62	..	930
208 Turaiyur	40	2,100	105	10	53	35	2,135
209 Tiruvottiyur ..	17	1,110	150	20	66	..	1,110
210 Uravakonda ..	23	925	75	10	40	418	1,139
211 Vayalpad ..	19	1,185	175	10	62	44	1,229
212 Venkatagiri ..	21	947	100	5	45	310	1,263
213 Vetapalem ..	13	730	100	10	56	25	755
214 Yemmiganur ..	21	595	50	10	29	6	601
215 Usilampatti ..	10	835	100	40	84	..	835
216 Viravanallur ..	15	527	100	5	35	20	547
217 Venkateswarapuram.	2	30	15	15	15	..	30
218 Cumbum	8	640	100	70	80	..	640
219 Batlagundu ..	9	460	100	25	51	85	545
220 Yellamanchili ..	10	239	40	4	24	..	239
221 Vriddhachalam ..	29	950	60	12	33	..	950
222 Puliyangudi ..	2	75	50	25	38	..	75

Cases pending.

Madura	2	Kumbakonam	1	Nuzvid	5
Bezwada	16	Vellore	4	Razole	2
Coimbatore	7	Dindigul	1	Samalkot	1
[illegible] ..	36	Tenali	1	Tiruvadamarudur	1
[illegible]	1	Virudhunagar	1	Tuni	1

TABLE No. VIII—*cont.*

Cases pending—cont.

Vizagapatam	1	Proddatur	1	Uravakonda	1
Rajahmundry	7	Allinagram	1	Yemmiganur	4
Bellary	8	Bhimavaram	1		
Ellore	2	Kavali	1		

TABLE No. IX.

Financial Statement of the Government Analyst Department for the years 1942 to 1946.

Receipts.	1941–42.	1942–43.	1943–44.	1944–45.
	RS.	RS.	RS.	RS.
1 Contribution from local bodies working the Madras Prevention of Adulteration Act including the fees for extra samples.	51,345	58,270	67,945	1,23,475
2 Fees received from private persons for examinations done.	1,080	1,310	3,830	10,980
3 Value of examinations done for Government bodies.	5,810	10,770	8,550	17,370
4 Government's share of revenue from fines, viz., 10 per cent of the total fines and half the excess, if any, over the contribution as per G.O. No. 5336, P.H., dated 12th November 1940.	28,975	52,850	84,282	1,42,824
Total ..	87,210	1,23,200	1,64,607	2,94,649

Estimated Expenditure.	1941–42.	1942–43.	1943–44.	1944–45.
1 Salaries and allowances of the staff of Government Analyst.	45,411	46,184	48,520	89,960
2 Superannuation allowance and pension on above.	75	75	81	1,499
3 Proportionate cost of certain common staff of the King Institute, Guindy.	1,063	1,175	1,296	1,452
4 Stores, instruments and chemicals including gas and water charges.	8,464	14,442	18,440	36,116
5 Contingencies	2,338	3,058	4,538	10,232
6 Customs duty	1,186	176	429	2,446
7 Electric current	539	663	567	1,525
8 Cost of stationery, clothing and printing ..	225	415	290	964
9 Rates and Taxes	448	681	360	1,948
10 Proportionate charges on cost of adult maintenance depreciated and interest on buildings, electric installation and other plant.	2,914	2,793	2,750	14,202
11 Proportionate cost of management and supervision by (Surgeon-General) and Director, King Institute, Guindy.	834	641	1,305	926
Total ..	63,497	70,303	78,666	1,61,270
Net profit ..	23,713	52,897	85,941	1,33,379

APPENDIX.

Municipalities which have raised their quota of samples during the years 1942–1946.

Municipality.	Old quota.	Present quota.	Date from which increased.
	1941–42.		
1 Udamalpet	4	8	1st February 1942.
2 Anantapur	4	6	1st November 1942.
3 Proddatur	4	6	1st February 1942.
	1942–43.		
1 Rajahmundry	12	18	1st June 1943.
2 Vizagapatam	12	24	15th July 1943.
3 Nellore	8	12	1st June 1943.
4 Palghat	8	12	1st August 1943.
5 Cuddapah	4	8	1st January 1943.
6 Cannanore	4	8	1st March 1943.
7 Tiruvannamalai	4	6	1st November 1942.
8 Peddapuram	4	6	1st April 1943.
9 Pollachi	4	6	Do.
	1943–44.		
1 Anakapalle	4	6	1st April 1944.
2 Palni	4	8	1st July 1944.
3 Cocanada	12	18	1st June 1944.
4 Bellary	8	12	1st August 1944.
5 Coonoor	8	12	1st September 1944.
	1944–46.		
1 Srivilliputtur	4	6	1st October 1944.
2 Chidambaram	4	8	Do.
3 Tanjore	12	18	1st November 1944.
4 Mangalore	12	18	Do.
5 Tinnevelly	12	18	Do.
6 Calicut	12	24	Do.
7 Karur	4	8	1st December 1944.
8 Anakapalle	6	12	1st January 1945.
9 Tiruppur	6	8	Do.
10 Pollachi	6	10	1st February 1945.
11 Karaikudi	4	8	Do.
12 Tenali	6	8	1st April 1945.
13 Mayavaram	4	8	Do.
14 Ongole	4	8	1st June 1945.
15 Ootcamund	12	18	Do.
16 Madura	50	100	1st July 1945.
17 Gudivada	4	8	1st August 1945.
18 Devakottai	4	6	1st April 1946.
19 Bodinayakkanur	4	6	1st January 1946.
20 [illegible]cherry	4	6	Do.

Government of Madras

EDUCATION AND PUBLIC HEALTH DEPARTMENT

(Public Health)

G.O. No. 1751, 20th May 1947

Administration Report—King Institute, Guindy—Report for the period from 1st October 1941 to 31st March 1946—Reviewed.

READ—the following papers :—

Letter from the Surgeon-General, dated the 11th December 1946, No. 69908-M.

Letter from the Surgeon-General, dated the 20th December 1946, No. 69908-M.

Order—No. 1751, P.H., dated 20th May 1947.

Recorded.

2. Annual administration reports on the King Institute, Guindy. were not prepared for the last four years owing to the war conditions. The Surgeon-General has now submitted a report on the Institute for the period from the 1st October 1941 to the 31st March 1946.

3. During the period under review, the activities of the Institute expanded in several directions. The new activities included the establishment of (i) a department of Anti-toxins, (ii) a section for Algology, (iii) a section for the manufacture and supply of essential sterile solutions for parenteral injections and (iv) the Blood Bank.

Vaccine lymph.—The supply of vaccine lymph reached a record total of 272,816 c.c. in 1944–45. Supplies were made to the Army authorities in South India, the American Army in the India-Burma theatre and also to the Governments of Bengal and Ceylon. A rapid method of purification of the lymph by cloroform was adopted with success.

Bacterial vaccines.—In 1942–43 there was a severe outbreak of cholera in almost all the districts in the Province, which called for maximum efforts on the part of the Institute for the manufacture and distribution of cholera vaccine. About 19 million doses of vaccine were issued and distribution was made from five subsidiary centres at select places in the Province. In addition to this, the Institute has also supplied cholera vaccine regularly to the Governments of Bengal, Central Province and Berar and to several Indian States.

4. *Foreign Studies and Research.*—During the period under review, the Director of the King Institute was deputed twice by the Government of India to the United States, etc., to study the technique of manufacture of typhus vaccine and the newer trends in medical education and research. In 1945, this Government also deputed one of the Assistant Directors to the United Kingdom to study the administrative procedures adopted in the control of biologicals. The A[illegible]al

Government Analyst was also deputed the same year to study the modern methods of food control and analysis in the United Kingdom and other foreign countries.

In the Institute, research was conducted in connection with the prevention and treatment of diseases like smallpox, influenza, cholera, etc., and also on water purification methods.

5. *General.*—The working of the Institute during the period has been entirely satisfactory.

(By order of His Excellency the Governor)

P. S. VISWANATHA AYYAR,
Joint Secretary to Government.

To the Surgeon-General.
,, the Director of Public Health.
,, the Sanitary Engineer [through the Chief Engineer, Public Works Department (Buildings and A.R.P.)].
,, the Director of King Institute, Guindy (through the Surgeon-General).
,, all Presidents of District Boards.
,, all Executive Authorities of Municipal Councils.
,, the President, Mettupalaiyam Panchayat Board.
,, the Mayor, Corporation of Madras.
,, the Accountant-General.
,, the Inspector of Municipal Councils and Local Boards.
,, the Principal, School of Indian Medicine.
,, the Inspector-General of Prisons (through the Home Department).
,, the Principal, Engineering College.
,, the Agent, Madras and Southern Mahratta Railway (with C.L.).
,, the Agent, South Indian Railway (with C.L.).
,, the Agent, Bengal-Nagpur Railway (with C.L.).
,, the Librarian, Legislative Assembly Secretariat.
,, the Librarian, Madras Secretariat.
,, the Departments of the Secretariat concerned.
,, the Director, Pasteur Institute, Coonoor (through the Surgeon-General).
,, the High Commissioner for India (with copies for India Office, Ministry of Health, British Museum).
,, the Madras Medical Association.
,, the Madras University.
,, the Andhra University.
,, the Annamalai University.
,, the Connemara Public Library, Madras.
,, the Madras Chamber of Commerce, Madras.
,, the Southern India Chamber of Commerce, Madras.
,, the Non-official Madras Members of the Council of State and the Legislative Assembly.
,, the Government Analyst, Madras (Analyst's report only).
,, others (vide Appendix to G.O. No. 2147, P.H., dated 13th September 1934).
,, the Home Department.
,, the Secretary, Public Service Commission, Madras (with C.L.).

Press.

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